MIDDLE FORK GOODNEWS RIVER FISHERIES STUDIES, 1999

By

Jim Menard

Regional Information Report[1] No. 3A00-17

Alaska Department of Fish and Game
Commercial Fisheries Division
Arctic-Yukon-Kuskokwim Region
333 Raspberry Road
Anchorage, Alaska 99518

March 2000

[1] The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate timely reporting of recently collected information, reports in this series undergo only limited internal review and may contain preliminary data; this information may be subsequently finalized and published in the formal literature. Consequently, these reports should not be cited without prior approval of the author or the Commercial Fisheries Division.

MIDDLE FORK GOODNEWS RIVER FISHERIES STUDIES, 1999

By

Jim Menard

Regional Information Report[1] No. 3A00-17

Alaska Department of Fish and Game
Commercial Fisheries Division
Arctic-Yukon-Kuskokwim Region
333 Raspberry Road
Anchorage, Alaska 99518

March 2000

[1] The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate timely reporting of recently collected information, reports in this series undergo only limited internal review and may contain preliminary data; this information may be subsequently finalized and published in the formal literature. Consequently, these reports should not be cited without prior approval of the author or the Commercial Fisheries Division.

AUTHOR

Jim Menard is a Kuskokwim Area Assistant Manager for the Alaska Department of Fish and Game, Commercial Fisheries Division, P. O. Box 1467, Bethel, AK 99559-1467.

ACKNOWLEDGMENTS

The author thanks the employees who worked long and irregular hours on the project, day and night, often in inclement weather. Although the project is normally staffed by Rob Stewart and Ed Chris, others also helped at the weir during the past season. Thanks to Mike Martz, Doug Bue, Paul Salomone, Nick Chris, Charlie Burkey, Phil Perry, Donna Elliot, Doug Lieb, Sharon Pritchett, Merrie Mendenhall, Chris Shelden, Jared Gregorio, Anne Kranawetter, and Danetta Aloysius. Mark Lisac of United States Fish and Wildlife Service (USFWS) provided funding to operate the project into September. Critical review of the manuscript was provided by Charlie Burkey, Larry Buklis, Paul Salomone, and Mark Lisac.

OFFICE OF EQUAL OPPORTUNITY (OEO) STATEMENT

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

Abundance, age, sex, and length data are summarized for 1999 Middle Fork Goodnews River spawning escapements of Pacific salmon *Oncorhynchus* as part of an ongoing project to collect baseline information. The escapement count of 3,221 chinook salmon *O. tshawytscha*, was below the escapement goal (3,500), but the actual chinook salmon escapement may have exceeded the goal as the weir was inoperable for 10 days in early August because of flooding. The escapement count of 48,205 sockeye salmon *O. nerka*, and 19,533 chum salmon *O. keta*, exceeded the escapement goals of 25,000 and 15,000 fish, respectively. In most years the project has not been operational during a majority of the pink salmon *O. gorbuscha*, and coho salmon *O. kisutch* runs, and no escapement goals have been established. However, the operation of the floating weir in 1999 allowed the majority of pink and coho salmon to be counted. Escapements of pink and coho salmon were 914 and 11,545 fish, respectively.

The escapement for chinook salmon in the 1990s has ranged from 1,903 to 4,836 fish (average 3,216 fish). The escapement for sockeye salmon ranged from 26,453 to 57,504 fish (average 41,675 fish), and the chum salmon escapement ranged from 6,410 to 40,125 fish (average 24,529 fish).

The predominant age classes of the fish sampled at the escapement project were age-1.3 sockeye, age-0.3 chum, and age-2.1 coho salmon. The age composition in the 1999 escapement was consistent with the age composition seen in most years.

KEY WORDS: Goodnews, chinook, sockeye, chum, pink, coho, escapement, *Oncorhynchus*, *tshawytscha*, *nerka*, *keta, gorbuscha, kitsutch*

INTRODUCTION

The Goodnews River originates in the Ahklun mountains and flows southwest approximately 60 miles to Goodnews Bay (Figure 1). The Middle Fork parallels the length of the mainstem (North Fork) Goodnews River before joining near its mouth. The Goodnews River system drains an area of approximately 910 square miles and contains many lakes. All five species of Pacific salmon reside in the Goodnews River drainage. The Alaska Department of Fish and Game (ADF&G) has operated a counting tower from 1981 through 1990, and a weir since 1991 on the Middle Fork Goodnews River (Schultz 1982, 1984a, 1984b, 1985, 1987; Schultz and Burkey 1989; Burkey 1989, 1990; Menard 1998, 1999).

Salmon Fisheries

Subsistence and commercial fisheries occur in Goodnews Bay, and sport and subsistence fisheries occur in the Goodnews River drainage (Burkey, et. al. 1997). District 5 (Goodnews Bay) is the southernmost salmon district in the Kuskokwim Area (Figure 2). Commercial fishing has occurred annually since 1968 in Goodnews Bay. Commercial fishing is conducted primarily with the use of drift gillnets in tidal channels in Goodnews Bay and a few set gillnets near the mouth of the bay. In 1999, commercial harvests of chinook *Oncorhynchus tshawytscha,* sockeye *O. nerka*, coho *O. kisutch*, and chum *O. keta* salmon were below the most recent ten-year (1989 - 1998) harvest average (Appendix 1). Although in 1999 there was no commercial harvest of pink *O. gorbuscha* salmon, the lack of harvest may not truly reflect abundance as pink salmon is the least commercially valuable species and is not targeted. Historically, the return of pink salmon in odd years is smaller than returns in even years.

Subsistence fishing is allowed throughout the Goodnews River drainage and in Goodnews Bay. Residents of the Goodnews Bay villages have long depended upon the fishery resources as a source of food. The Department has quantified subsistence harvests in Goodnews Bay since 1977. Harvest estimates are made from interviews with subsistence fishing families in October or November (Appendix 2).

Sport fishing occurs throughout the Goodnews River drainage. Many sport fish anglers take float trips from the lakes to Goodnews Bay. In the 1990s there has been one semi-permanent sport fishing lodge located on the North Fork Goodnews River approximately one mile upriver from the confluence of the North and Middle Forks. Also, there is one temporary sport fish camp located on the Middle Fork Goodnews River, approximately 15 miles upriver from the confluence of the North and Middle Forks.

Project History

The Middle Fork Goodnews River project is the third oldest continuing salmon escapement assessment project in the Kuskokwim Area. The Middle Fork Goodnews River study site for both the tower operations from 1981 through 1990 and for the weir operations from 1991 through 1999 was approximately 11 river miles (18 km) from Goodnews Bay village (Figure 1).

The project was initiated as a counting tower in 1981 and operated for ten seasons. A major drawback to the tower project was the lack of visibility under high and turbid water conditions. This made it difficult to identify the salmon species, particularly when the salmon lacked spawning coloration. Another drawback to the tower project was the high labor costs because of the need to conduct counts of fish passage on an hourly basis.

In 1991 a fixed-panel weir was installed approximately 200 meters downstream from the counting tower location. Labor costs were lowered because the passage of fish through the weir could be controlled, eliminating the need to monitor the fish passage hourly. The live trap connected to the weir eliminated the need for beach seining to capture salmon for age-sex-length (ASL) information. Because of the efficiency of the weir the personnel needed for project operations was reduced from three to two.

The fixed-panel weir was operated from 1991 through mid-season in 1997. Species identification improved with the weir, as the observer was now within five feet of the salmon passing upstream. During high water events, frequent monitoring was necessary to detect any openings that allowed fish to pass upstream without being enumerated. Openings in the weir occurred most often at the base, where the current would dig a hole in the gravel underneath the weir panel. In some years, periods of high water required the weir to be removed from the stream to prevent it from being "washed out" downstream.

In late July 1997, the fixed-panel weir was removed and a new resistance-board "floating weir" was installed. The resistance-board weir was able to handle higher water levels and a heavier debris load than the fixed-panel weir. The use of a resistance-board weir allowed the project to operate, for the first time, into September, which is traditionally a time period of higher water. In 1998 and 1999 the resistance-board weir was used throughout the project duration.

Escapement Objectives

Preliminary escapement objectives at the Middle Fork Goodnews River tower of 3,000 to 4,000 chinook, 35,000 to 45,000 sockeye and 13,000 to 18,000 chum salmon were established in 1983

(Schultz, 1984b). The escapement objective for sockeye salmon was lowered to 20,000 to 30,000 in 1989 (Burkey, 1990). Evaluation of the sockeye salmon exploitation rate in previous years indicated that historical harvest levels could be maintained with a reduced escapement objective (Appendix 2).

Escapement objectives for North Fork Goodnews River and Lake aerial surveys are 1,600 chinook, 15,000 sockeye and 17,000 chum salmon. Escapement objectives for Middle Fork Goodnews River and Lakes aerial surveys are 800 chinook, 5,000 sockeye and 4,000 chum salmon. The average estimated sockeye exploitation rate (subsistence and commercial harvests), in the 1990s, was 29% with a range of 14 to 43% (Appendix 2).

The biological escapement goals (BEG's) for chinook, sockeye, and chum salmon past the weir have been set at the midpoint of the escapement objectives, i.e., 3,500 chinook, 25,000 sockeye, and 15,000 chum salmon. The BEG's represent those escapement levels thought to be necessary to maintain returns at current levels, and are based on historical aerial surveys, counting tower and weir information. BEG's are useful in evaluating abundance trends and the success of fishery management strategies. Inseason cumulative escapement estimates can be compared with historical migratory timing to qualitatively assess whether BEG's will be achieved. This information helps the managers of the Goodnews Bay commercial fishery determine the appropriate level of commercial fishing effort. Continued assessment of salmon returns may include adjustments of the BEG's in the future to optimize salmon production.

METHODS

Materials

The resistance-board weir was approximately 130 ft (39.6 m) in length and attached at both ends to a fixed-panel weir which was anchored to shore by a short section of fixed-picket weir. The resistance-board "floating weir" consisted of two major parts. The weir was anchored to the stream bottom with duckbill anchors that secured a steel rail that ran perpendicular to the stream flow. The 4 ft (1.22m) wide and 20 ft (6.10 m) long panels had two hooks which attached to a cable on the steel rail. Each panel was comprised of 18, PVC Schedule 40, pipes (1in diameter), with 2 ft (.61m) by 4 ft (1.22m) resistance boards attached to the downstream edge. The resistance boards provide lift to buoy the downstream end of the panel above the water.

The fixed-panel weir consisted of three major parts. Five wooden tripods, composed of three beams, 4 in (10.16 cm) by 6 in (15.24 cm), and a small wooden platform (approximately 2 ft (60.96 cm) below the intersection of the beams), were installed from the right bank (facing downstream) to the beginning of the resistance-board weir (approximately 50 ft). On the left bank two tripods were used. Sandbags were placed on the tripod platform to provide stability against the current. Two 3 in (7.62 cm) diameter aluminum pipes (10 ft, 3.05 m) were positioned to span the distance between

the front legs of adjacent tripods. The third major part of the weir consisted of weir panels positioned to rest on the upstream surface of the aluminum pipe. Weir panels consisted of fifteen aluminum pipes (pickets) 1 in (2.54 cm) in diameter, and measured 2ft 6in (.76 m) wide by 6 ft 8 in (2.03 m) in length.

The fixed-picket weir is similar to the fixed-panel weir. The fixed-picket weir was approximately 2-3 ft long, and extended from the bank to fixed-panel weir on each side of the river. One tripod was used and horizontal aluminum bars with holes, to allow individual pipes to be placed through, were placed across the tripod. The aluminum bars were secured to shore and individual pipes (1 in diameter) were slid through the bar holes.

Escapement Estimates

The weir operated from June 25 until August 4 and from August 14 until September 26. Fish were counted at different locations along the weir depending on water conditions. If the water level was high, the fish congregated behind the fixed-picket portion of the weir and a few pickets could be removed to allow for the upstream passage of fish. At lower water levels, the fish were counted through the weir by partially removing a panel, in the fixed-panel section of the weir, or in the resistance-board section of the weir a specialized passing chute panel could be opened to allow fish passage. To help identify the salmon species in the deeper water, two aluminum panels, which aided visibility, were placed on the stream bottom.

High water levels in 1999 delayed the installation of the weir until late June. The weir was "fish tight" at 1200 hours on June 25. Historically the average proportion of the salmon run past the weir by June 25 has been approximately 1% of the chum run, 5% of the chinook run and 5% of the sockeye run (Appendix 4). In 1999 the salmon passage at the weir indicated one of the latest run timings in the history of the project and therefore no interpolation for salmon passage previous to June 25 was attempted. In cases where the weir was not "fish tight" for a short duration, a simple interpolation was used to estimate fish passage based on the estimated time there was a breach in the weir.

Migration Timing

To evaluate fish travel time between the Goodnews Bay commercial fishery and the weir site, the cumulative percent escapement counts were compared with the cumulative percent commercial fishery catch. A plot of both the cumulative commercial catch and the cumulative escapement counts to date was made. Initiation of the fishery, fishing conditions, salmon abundance and many other factors can influence the estimate of travel time and this method was used as a very approximate estimate of travel time.

Age, Sex, and Length

Escapement sampling was conducted based on a pulse sampling design (Molyneaux and DuBois 1999). Most sampling effort was focused on sockeye, chum, and coho salmon, and a limited number of chinook salmon were also sampled. The sample size goal for each pulse sample was 200 fish per species. Each pulse sample was used to estimate the ASL composition of the run for a given temporal stratum. A weighted mean, based on relative fish passage during each defined stratum as the weight, was used to estimate age composition of the total season passage.

Fish were captured with a trap installed in the fixed-panel weir. A weir panel would be moved to allow salmon to pass upstream into the trap and the panel would be replaced to prevent their downstream movement.

Scales were collected from the left side of the fish approximately two rows above the lateral line in the area crossed by a diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin (INPFC 1963). Scales were mounted on gum cards and impressions made on cellulose acetate cards with a heated hydraulic press (Clutter and Whitesel 1956). Salmon were measured to the nearest one-half centimeter from the middle of the eye to the fork of the tail. The sex of each fish was determined from external characteristics.

Ages for salmon were determined by examining scales (Mosher 1968). European notation (e.g., 2.2; Koo 1962) was used to record ages: numerals preceding the decimal refer to number of freshwater annuli and numerals following the decimal refer to number of marine annuli. Total age from time of egg deposition or brood year is the sum of these numbers plus one.

Aerial Survey

The Department usually conducts spawning ground aerial surveys each year on the Goodnews River system (Appendix 3). Aerial surveys occur from a fixed-wing airplane at a height of approximately 500 feet. Aerial surveys count only a percentage of the fish present, which may vary depending on the experience of the surveyor, weather conditions and the spawning stage of the salmon at the time of the survey. The total estimate of passage on both the North and Middle Forks Goodnews River uses both the weir and aerial survey data (Appendix 2). The percentage of the salmon observed by the surveyor on the Middle Fork was calculated by comparing the aerial survey count above the weir site with the weir count through that date. The North Fork aerial survey count is then adjusted for observer efficiency to estimate the escapement in that river up until and including the date of the aerial survey. Expanding the aerial survey count of the entire Goodnews River to estimate total escapement based on this relationship assumes the surveyor was observing the same percentage of the fish throughout the survey area. The final estimate of North Fork escapement is then adjusted for the percentage of passage through the Middle Fork weir after the survey.

Escapement objectives based on aerial index counts (Appendix 3) do not represent total escapement, but may reflect annual spawner abundance trends when made using standard survey methods under acceptable survey conditions.

Atmospheric and Hydrological Observations

Project personnel recorded standard environmental factors during project operations. Water level, precipitation, air and water temperatures were normally recorded at the site. Visual estimates of wind velocity and sky conditions were also recorded. The water level measurement has been standardized since 1998. The present standardization results in the river overflowing the banks at 32 inches (81.3 cm).

RESULTS

Salmon Fisheries

The 1999 commercial salmon harvest in Goodnews Bay was 1,888 chinook, 22,910 sockeye, 11,562 chum and 2,474 coho salmon. Catches for all species were below the 10-year average (Appendix 1). Seventy-three commercial permits fished at least one time during the season, which was also below the 10-year average. The subsistence harvest was estimated to be 871 chinook, 872 sockeye, 281 chum and 582 coho salmon. The exploitation rate estimate of the run (commercial and subsistence harvest) was 22% for chinook, 14% for sockeye, and 14% for chum salmon (Appendix 2). No estimate for coho or pink exploitation was made because of the lack of coho and pink escapement data from the North Fork Goodnews River.

The most recent sport fishing effort estimate available is for 1997. That estimate of 6,342 angler-days (Howe et al. 1998) was nearly triple the reported previous year's effort of 2,322 angler-days (Howe et al. 1997). Howe et al. (1998) reported a five-year average (1993 - 97) of 2,802 angler-days. The 5-year average (1993 – 97) sport fish harvest was estimated to be 101 chinook, 63 sockeye, 39 chum, 18 pink and 384 coho salmon.

Escapement Estimates

Estimates of salmon escapement in 1999 at the Middle Fork Goodnews River weir were 3,221 chinook, 48,205 sockeye, 19,533 chum, 914 pink, and 11,545 coho salmon (Table 1). Escapement counts were made from June 25 through August 3 and from August 14 until the evening of September 26. No interpolation was attempted for the missed days in August during the flood. During the summer, 1,799 Dolly Varden were enumerated (Table 2). Carcass counts on the upstream side of the weir were 228 chinook, 225 sockeye, 1,539 chum, 158 pink, and 19 coho

salmon (Table 3). There were 9 Dolly Varden and 1 rainbow trout carcasses counted during the season.

The escapement of 3,221 chinook salmon fell short of the 3,500 goal. In the 1990s the chinook salmon escapement goal has been reached in only four of ten years (Apendix 13). The estimated chinook salmon escapement in the years 1990 through 1999 ranged from 1,903 in 1992 to 4,836 in 1995. The average escapement from 1990 through 1999 was 3,216 chinook salmon.

The escapement goal of 25,000 sockeye has been reached for ten consecutive years (Appendix 13). The estimated sockeye salmon escapement in the years 1990 through 1999 ranged from 26,452 in 1993 to 57,504 in 1996. The average escapement from 1990 through 1999 was 41,675 sockeye salmon.

The escapement goal of 15,000 chum salmon was reached in 1999, and in the 1990s has been reached in nine of ten years. The estimated chum salmon escapement in the years 1990 through 1999 ranged from 6,410 in 1990 to 40,125 in 1996. The average escapement from 1990 through 1999 was 24,529 chum salmon.

No escapement goals have been established for pink or coho salmon. Except for 1997 - 1999, the project had been terminated before a significant proportion of the pink and coho salmon migration had occurred. The highest escapements recorded were 38,705 pink salmon in 1994, and previous to 1998, 10,869 coho salmon in 1996. The 1999 coho escapement was one-third of the 1998 escapement of 35,441 fish.

Migration Timing

Because of the weir being inoperable for the latter portion of the chinook, sockeye and chum run, no migration timing estimate from the fishery to the weir was attempted. However, migration timing curves of chinook, sockeye, chum were plotted (Figures 4 – 6) using the historical migration timing information to compare with 1999 estimates. Comparisons of the migration timing with historical migration timing will be analyzed in the Discussion section of the report. No migration timing estimate of coho salmon from the fishery to the weir was attempted because of the suspension of commercial fishing during coho season. The coho run timing curve at the weir is plotted in Figure 7 and the midpoint of the run was September 1.

Age, Sex, and Length

An estimate for ASL composition of the chinook harvest was not possible because the first third of the harvest was not sampled. The later two-thirds of the harvest sampled had a majority of age-1.4 fish. In 1998 the majority of the chinook harvest was age-1.3 fish. The ASL composition of the sockeye harvest was similar to previous years and was 59% male to 41% female and 69% of the fish were age 1.3. The mean length for age-1.3 fish was 580 mm for males and 546 mm for

females. The ASL composition of the chum harvest was 45% male and 55% female and the majority of the fish (77%) were age 0.3. The mean length for age-0.3 fish was 589 mm for males and 565 mm for females and was comparable to previous years. The coho harvest samples were 52% males and 48% females and were 85% age-2.1 fish. The mean length was approximately 595 mm for both males and females. The mean length was 20 mm less when compared to 1998 commercial coho data.

Chinook salmon were not captured in sufficient numbers in the weir trap to allow an estimate of age, sex and length composition. Samples from the chinook salmon commercial gillnet catch were comprised of age 4 to 7 years old fish (Appendix 5). Mean length of the commercial catch increased with increasing age (Appendix 6).

Sockeye salmon sampled were predominantly age 1.3 in all sampling stratums throughout the escapement (Table 4) and the commercial catch (Appendix 7). Mean length of the escapement samples was larger for males than females in all age classes with the exception of age 0.4 and age 2.4, which had only two fish sampled in each age class. Mean length in the same brood year, but different age group, e.g. ages 1.3 and 2.2, exhibited larger size in the age group having more ocean years (Table 5). Mean length in the commercial catch samples was larger for males than females in all brood years and exhibited larger size in the group having more ocean years (Appendix 8).

Chum salmon sampled in the commercial catch (Appendix 9) and the escapement (Table 6) were primarily age-0.3 fish. Generally the proportion of age-0.4 fish declined and the proportion of age-0.3 fish increased as the season progressed. The mean length of males was larger than females in each age class in both the escapement (Table 7) and the commercial catch (Appendix 10).

Coho salmon sampled were primarily age-2.1 fish. Age-1.1 and age-3.1 coho salmon comprised 12% of the species escapement (Table 8). Length measurements taken in 1999 did not exhibit noticeable differences in length between sexes of age-2.1 coho salmon (Table 9). There were not enough samples of the other age classes to make comparisons.

Aerial Survey

In 1999, no aerial surveys of the Goodnews River drainage were flown. Overall, in the 1990s escapement objectives by aerial surveys for both components of the Goodnews River drainage (North Fork Goodnews River and Lake, and Middle Fork Goodnews River and Lakes) were reached in only two years for chinook salmon and one year for sockeye salmon (Appendix 3). However, in only three of ten years were there acceptable survey conditions throughout the drainage.

Atmospheric and Hydrological Observations

Observations at the project site were taken from June 4 until September 30 (Table 10). Air temperatures ranged from 24 to 77 degrees Fahrenheit and water temperatures ranged from 40 to 58 degrees Fahrenheit. The highest precipitation was on August 3 (0.94 inches, 2.4 cm) and the highest water level (+50 inches, +127 cm) was on August 5. The water level reached its lowest point on July 17. A graph of the water level readings taken at 0800 hours daily is plotted with the daily precipitation readings in Figure 3.

DISCUSSION

Although the resistance-board "floating weir" has allowed the project to operate during higher water periods, the installation process can be delayed due to water conditions. In 1999, the installation of the resistance-board weir was delayed approximately 10 days because of high water. The weir was operational from 1200 hours on June 25 until the morning of August 4 when the fixed portion of the weir was pulled and the floating portion of the weir was submerged by flooding. The weir was operational again at 1900 hours on August 14 until 1800 hours on September 26. No estimates were made for any species when the weir was not operational because of the difficulty of modeling 1999 run timing due to the extremely late run timing and large fluctuations in daily passage. Normally during the first two weeks of August there is low salmon passage at the weir.

Salmon Fisheries

The commercial fishery harvest of 38,834 salmon was the lowest catch since 1985. The major reason for the low salmon harvest was the suspension of fishing during coho season because of the extremely poor catches. Several other factors combined to reduce the harvest. There were 20 commercial fishing periods in 1999, which was 26% below the 10-year average of 27 periods. Although there was a slight upswing in the number of permits fished, compared to the last three years, the effort was still below the 10-year average.

Beginning in 1996, the number of permits fished has been approximately half the number of permits fished in the early 1990s. From 1991 to 1995, the number of permits fished ranged from 111 to 118, but in 1996, 1997, and 1998 there were 53, 54, and 50 permits fished, respectively. In 1999 there were 73 permits fished and this increase compared to the past three years may have been the result of reduced fishing time in District 4 this year. The lower harvest of sockeye and chum salmon in 1999 may be due to approximately one-third fewer permit holders participating this year during July when compared to the early 1990s (Appendix 1).

The subsistence fishery harvest of 871 chinook salmon was the highest harvest since the early 1980s and the subsistence harvest of 872 sockeye salmon was the highest since 1992. However, the chum salmon subsistence harvest of 281 fish was below most harvests in the 1990s. The

subsistence harvest of 439 coho salmon was slightly above the last several years, but less than half of the harvests in the early 1990s.

The total run size return to the North Fork and Middle Fork Goodnews Rivers was estimated to be 12,545 chinook, 171,714 sockeye, and 82,737 chum salmon (Appendix 2). The exploitation rates (commercial and subsistence harvest) of 22% for chinook, 14% for sockeye and 14% for chum salmon were comparable to previous years. The sport fish harvest is not included in the exploitation rate as some of the harvest occurs upriver from the Middle Fork Goodnews weir. Also, the small sport fish harvest would have little effect on the exploitation rates.

Escapement Estimates

In 1999 the actual count of chinook salmon escapement was 3,221 fish. No estimates were made for chinook passage previous to June 25, or during flooding in August. Few fish were believed to have passed before the weir became operational in June, as the total chinook count, during the last six days of June, was under 2% of the season's escapement. Historically less than 2% of the chinook run passes after August 3, but in 1999 run timing was extremely late and 8% of the escapement counted passed in the first three days of August. It is possible that 10% of the run may have passed in early August when the weir was not operational and therefore the 3,500 chinook salmon escapement goal may have been reached. Although in 1999 no counts were estimated, in previous years interpolation has been done when a reasonable estimate could be made. The percentage of the escapement that is estimated by species and year appears in Appendix 14.

The management strategy the last six years has been to delay the first commercial fishery opening, until the last week in June, in an attempt to increase escapement of chinook salmon into the Goodnews River drainage. This strategy has resulted in the escapement goal of chinook salmon, past the weir, being met three times in the six year period, 1994 – 1999. In the previous six years, 1988 – 1993, the chinook escapement goal had been met one time. The first commercial opening of 1999, on July 2, was the latest the commercial fishing season opened since 1971. The following week only two openings occurred rather than the usual three openings per week to allow further chinook and sockeye salmon escapement.

The strategy to delay the initiation of the commercial fishery also affects sockeye and chum escapement. During the last five years both sockeye and chum escapement goals were reached (Appendix 13). In 1999, the number of sockeye salmon counted was 48,205 fish and the number of chum salmon counted was 19,533 fish. Few chum salmon were believed to have passed before the weir became operational in June, as the total chum count, during the last six days of June, was under 1% of the season's escapement. Likely some sockeye salmon passed before the weir became operational in June as 8% of the season's escapement count passed in the last six days of June. Historically less than 2% of the sockeye run passes after August 3, and although there was later run timing observed in 1999, less than 1% of the sockeye run counted passed the weir in the first three

days of August. In comparison 8% of the chum salmon counted passed in the first three days of August. Historically approximately 5% of the chum run passes after August 3. It is possible that up to 10% of the chum run may have passed in early August when the weir was not operational

The pink salmon escapement count was 914 fish and no estimate was made for the ten days in August where the weir was not operational. The first pink salmon to pass through the weir was on June 30 and the last to pass through the weir was on September 23. No interpolation was attempted for the time the weir was inoperable in August because of the paucity of data.

The escapement count for coho salmon was 11,545 fish from August 14 until September 26. No interpolation was made for coho passage previous to August 14 although there likely was a few hundred fish. From 1991 – 1998 there were five years when coho salmon were counted with no interpolation during early August and the count through August 14 ranged from 127 to 598 coho with an average of 365 fish. No coho salmon passed through the weir after September 23 in 1999.

The number of carcasses on the upstream side of the weir was enumerated (Table 3) and as in most years, chum salmon made up the majority of the carcasses. The larger number of chum carcasses on the weir potentially indicates that their freshwater life span is shorter than that of other species. In addition, the number of carcasses on the weir was likely a function of distance of spawning activity from the weir. The majority of sockeye salmon observed during previous aerial surveys spawn higher in the drainage than chum salmon. However, because the weir was inoperable in early August for ten days no comparison of carcass numbers can be made with previous years.

In 1999, the passage of Dolly Varden was enumerated at the weir (Table 2). No attempt was made to estimate the passage of Dolly Varden when the weir was not operational due to the paucity of data. The 1999 passage of 1,799 Dolly Varden was the lowest number recorded since enumeration for the species began in 1996. The run timing in all years has shown the largest passage of Dolly Varden in the second and third weeks of July. In 1999 there were tens of thousands of smaller Dolly Varden that passed through the counting chute in later August and September. These smaller Dolly Varden were not counted because they were believed to be non-spawners.

Whitefish and rainbow trout were not enumerated. Some whitefish are small enough to pass through the spaces between the PVC pipe in the weir panels, but none have ever been observed squeezing through. A few rainbow trout did move upstream and downstream through the counting chute and were assumed to be resident fish.

Migration Timing

Migration timing curves of chinook, sockeye, chum and coho salmon were plotted in Figures 4 – 7. The escapement run timing curves, for chinook, sockeye, and chum salmon were initiated on June 25 with the assumption that no fish passed previous to that date. Also, the run timing curves for 1999 were only plotted until the weir was inoperable on the morning of August 4. Historically the

chinook, sockeye, and chum runs were 95% past the weir by August 4. However, in 1999 delayed run timing was seen when compared to the historical timing curves and slightly over 90% of the chinook, sockeye, and chum were counted before August 4. Likely the counts for 10 additional days in early August would have shifted the 1999 run timing curves showing even later run timing when compared to the historical averages. The escapement run timing curve for coho salmon was initiated on August 14 with the assumption that no coho passed previous to that date. In this case the run timing curve would have been shifted earlier if substantial numbers of coho salmon passed previous to August 14.

As there are confounding factors in estimating the migration timing other assumptions were also made. In the commercial fishery the majority of the harvest is occurring on the stocks of each fork, and the assumption is that the run timing is the same for each fork. Also, the commercial harvest removes fish from the run and therefore affects escapement past the weir. The historical average used in estimating passage at the weir was taken from four of the preceding six years. The more recent historical average was used because in the past six years the commercial fishery has begun in the last few days of June, whereas before 1993 the commercial fishery usually began in mid-June. The historical average from 1981 – 1997 does appear in Appendix 4, as a comparison, but was not used.

The mid-1990s historical run timing past the weir for chinook, sockeye and chum salmon are plotted with the 1999 commercial catch and escapement (Figures 4 – 6). Assuming the initialization of the 1999 run timing curve is correct, the chum and sockeye runs are several days later when compared to the historical averages. Chinook run timing in 1999 was one to two weeks later than normal. The midpoint of the coho run at the weir was September 1, which is comparable with the 1997 midpoint of August 30 and the 1998 midpoint of August 29.

The plots of chinook, chum, and coho salmon appear similar in that the cumulative percentage of the commercial catch of each species precedes the escapement cumulative percentage. However, for sockeye salmon the pattern is reversed, as the escapement cumulative percentage precedes the cumulative percentage of the commercial catch. Similar migration timing patterns in chinook and chum salmon had been seen in previous years and estimates of migration timing from the commercial district to the weir for chinook and chum have ranged from 10 to 18 days (Burkey 1989; Schultz and Burkey 1989). The sockeye salmon travel time from the commercial fishery to the weir site has been estimated at five to seven days in previous years (Burkey 1989; Schultz and Burkey 1989). In 1998 the coho salmon migration time from the commercial fishery to the weir was approximately ten days (Menard 1999).

Age, Sex, and Length

Age compositions of escapements can sometimes be useful for developing stock-recruitment models, which can be used to project run size. Most chinook salmon return to the Middle Fork

Goodnews River as 4-, 5- and 6-year-old fish (Menard 1999). In 1999 few chinook salmon were captured and therefore no determination of the age and sex composition of the run was possible. The lack of chinook salmon samples was because of the inability to capture them in the weir trap. The chinook salmon appear reluctant to enter the weir trap when there were numerous sockeye and chum salmon entering the trap (Rob Stewart, ADF&G, personal communication).

Most sockeye salmon return to the Middle Fork Goodnews River as 5-year-old fish (Menard 1999). As in previous years the majority of the sockeye salmon sampled in 1999 at the weir (Table 4) and the majority of the fish harvested in the commercial fishery were 5-year-old fish (Appendix 7). Of those fish sampled in the escapement, length comparisons were similar to previous years. The mean length of males was larger than females in each brood year, where there were sufficient samples, in both the escapement (Table 5) and the commercial catch (Appendix 8).

Most chum salmon return as 4- and 5-year-old fish (age classes 0.3 and 0.4), and historically comprise over 90% of the samples at the project (Menard 1999). In 1999 over 99% of the chum salmon sampled at the weir (Table 6) and in the commercial catch (Appendix 9) were age-0.3 and age-0.4 fish. Age-0.3 fish comprised 65% of the samples at the weir, and 77% of the fish sampled in the commercial catch. The normal tendency for the proportion of age-0.4 fish to decline and the proportion of age-0.3 fish to increase as the season progressed was observed in 1999.

Most coho salmon return to the Middle Fork Goodnews River as 4-year-old fish (age 2.1) and nearly all coho salmon returning to spawn had spent one year in salt water. In 1999, mean length increased with increasing age. Compared to 1998 the age-1.1 fish mean length was approximately 40 mm less in 1999 (Table 9). Age-2.1 fish were slightly smaller in 1999 when compared to 1998. There is little coho salmon ASL data from previous years except for 1998.

The coho salmon escapement age composition (Table 8) was similar to the age composition from the commercial catch samples (Appendix 11). Approximately 85% of the commercial samples were age-2.1 fish and 88% of the fish sampled from the weir trap were age 2.1. The mean length of the commercial catch samples was slightly larger than the escapement samples (Table 9), except for age-3.1 fish. There was no significant difference in the size of age-2.1 and -3.1 coho salmon commercial catch samples, but age-1.1 fish were slightly smaller (Appendix 12).

Aerial Survey

Department personnel conducted no aerial surveys of the Goodnews River drainage in 1999 because of weather and lack of aircraft. Historically, aerial surveys of the Goodnews River have had limited success, primarily because of the large area involved and poor weather conditions. In the 1990s, because of these limitations, the management staff believes only two surveys provided an accurate assessment of escapement indices for chinook and sockeye salmon, and only one survey provided an accurate assessment index for chum salmon. Few surveys for coho salmon have been flown in the past due to poor conditions.

LITERATURE CITED

Burkey Jr., C. 1989. Goodnews River Fisheries Studies, 1988. Alaska Department of Fish and Game, Commercial Fisheries Division, AYK Region, Regional Information Report No. 3B89-19, Bethel.

Burkey Jr., C. 1990. Goodnews River Fisheries Studies, 1989. Alaska Department of Fish and Game, Commercial Fisheries Division, AYK Region, Regional Information Report No. 3B90-16, Bethel.

Burkey Jr., C., and T. Cappiello, J. Menard, and D. B. Molyneaux. 1997. Report to the Alaska Board of Fisheries, Kuskokwim Area, 1997. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, AYK Region, Regional Information Report No. 3A97-44, Anchorage.

Clutter, R., and L. Whitesel. 1956. Collection and interpretation of sockeye salmon scales. Bulletin of the International Pacific Salmon Fisheries Commission No. 9. Vancouver, British Columbia.

Howe, A. L., G. Fidler, C. Olnes, A. E. Bingham, and M. J. Mills. 1997. Harvest, catch, and participation in Alaska sport fisheries during 1996. Alaska Department of Fish and Game, Sport Fish Division, Fishery Data Series No. 97-29, Anchorage.

Howe, A. L., G. Fidler, C. Olnes, A. E. Bingham, and M. J. Mills. 1998. Harvest, catch, and participation in Alaska sport fisheries during 1997. Alaska Department of Fish and Game, Sport Fish Division, Fishery Data Series No. 98-25, Anchorage.

INPFC (International North Pacific Fisheries Commission). 1963. Annual Report, 1961. Vancouver, British Columbia.

Koo, T. S. Y. 1962. Age designation in salmon. Pages 37-48 *in* T. S. Y. Koo, editor. Studies of Alaska red salmon. University of Washington Publications in Fisheries, New Series, Volume I, Seattle.

Menard, J. 1998. Middle Fork Goodnews River Fisheries Studies, 1990 – 1997. Alaska Department of Fish and Game, Commercial Fisheries Division, Regional Information Report No. 3A98-30, Anchorage.

LITERATURE CITED (Continued)

Menard, J. 1999. Middle Fork Goodnews River Fisheries Studies, 1998. Alaska Department of Fish and Game, Commercial Fisheries Division, Regional Information Report No. 3A99-13, Anchorage.

Molyneaux, D. B. and L. DuBois. 1999. Salmon age, sex, and length catalog for the Kuskokwim area, 1998 progress report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 3A99-15, Anchorage.

Mosher, K. 1968. Photographic atlas of sockeye salmon scales. Fishery Bulletin 67:243-280.

Schultz, K. 1982. Goodnews River Tower Study, 1982. Alaska Department of Fish and Game, Commercial Fisheries Division, AYK Region, Kuskokwim Salmon Escapement Report No. 24, Bethel.

Schultz, K. 1984a. Goodnews River Counting Tower Study, 1983. Alaska Department of Fish and Game, Commercial Fisheries Division, AYK Region, Kuskokwim Salmon Escapement Report No. 33, Bethel.

Schultz, K. 1984b. Goodnews River Studies, 1984. Alaska Department of Fish and Game, Commercial Fisheries Division, AYK Region, Kuskokwim Salmon Escapement Report No. 34, Bethel.

Schultz, K. 1985. Goodnews River Studies, 1985. Alaska Department of Fish and Game, Commercial Fisheries Division, AYK Region, Kuskokwim Salmon Escapement Report No. 38, Bethel.

Schultz, K. 1987. Goodnews River Studies, 1986. Alaska Department of Fish and Game, Commercial Fisheries Division, AYK Region, Kuskokwim Salmon Escapement Report No. 39, Bethel.

Schultz, K. and C. Burkey, Jr. 1989. Goodnews River Fisheries Studies, 1987. Alaska Department of Fish and Game, Commercial Fisheries Division, AYK Region, Regional Information Report No. 3B89-02, Bethel.

Table 1. Middle Fork Goodnews River estimated daily salmon escapement, 1999.

DATE	CHINOOK		SOCKEYE		CHUM		COHO		PINK	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
6/25 [a]	0	0	79	79	0	0	0	0	0	0
6/26	1	1	518	597	2	2	0	0	0	0
6/27	4	5	651	1,248	9	11	0	0	0	0
6/28	8	13	720	1,968	16	27	0	0	0	0
6/29	6	19	1,208	3,176	26	53	0	0	0	0
6/30	30	49	873	4,049	41	94	0	0	1	1
7/01	7	56	996	5,045	23	117	0	0	3	4
7/02	8	64	1,859	6,904	141	258	0	0	2	6
7/03	5	69	1,592	8,496	49	307	0	0	1	7
7/04	45	114	2,059	10,555	217	524	0	0	2	9
7/05	76	190	2,813	13,368	466	990	0	0	0	9
7/06	62	252	2,888	16,256	371	1,361	0	0	6	15
7/07	91	343	3,284	19,540	279	1,640	0	0	3	18
7/08	246	589	3,268	22,808	1,141	2,781	0	0	12	30
7/09 [b]	13	602	2,000	24,808	481	3,262	0	0	4	34
7/10	28	630	1,667	26,475	259	3,521	0	0	3	37
7/11	96	726	1,837	28,312	821	4,342	0	0	4	41
7/12	109	835	2,362	30,674	1,103	5,445	0	0	8	49
7/13	46	881	1,459	32,133	742	6,187	0	0	9	58
7/14	66	947	1,160	33,293	493	6,680	0	0	4	62
7/15	117	1,064	1,390	34,683	563	7,243	0	0	14	76
7/16	82	1,146	2,122	36,805	550	7,793	0	0	18	94
7/17	151	1,297	1,558	38,363	474	8,267	0	0	10	104
7/18	125	1,422	1,365	39,728	1,490	9,757	0	0	42	146
7/19	225	1,647	1,256	40,984	1,081	10,838	0	0	15	161
7/20	65	1,712	1,215	42,199	877	11,715	0	0	20	181
7/21	202	1,914	644	42,843	588	12,303	0	0	34	215
7/22	27	1,941	328	43,171	266	12,569	0	0	44	259
7/23	13	1,954	658	43,829	277	12,846	0	0	33	292
7/24	267	2,221	1,300	45,129	1,397	14,243	0	0	100	392
7/25	332	2,553	606	45,735	488	14,731	0	0	52	444
7/26	12	2,565	349	46,084	194	14,925	0	0	20	464
7/27	49	2,614	228	46,312	539	15,464	0	0	31	495
7/28	80	2,694	160	46,472	366	15,830	0	0	28	523
7/29	90	2,784	660	47,132	984	16,814	0	0	73	596
7/30	5	2,789	100	47,232	157	16,971	0	0	12	608
7/31	105	2,894	231	47,463	616	17,587	0	0	30	638
8/01	7	2,901	57	47,520	368	17,955	0	0	24	662
8/02	169	3,070	172	47,692	431	18,386	0	0	35	697
8/03	92	3,162	104	47,796	724	19,110	0	0	34	731
8/04 [c]										
8/14	2	3,164	7	47,803	23	19,133	11	11	6	737
8/15	3	3,167	22	47,825	42	19,175	174	185	8	745
8/16	1	3,168	6	47,831	25	19,200	33	218	4	749
8/17	9	3,177	20	47,851	68	19,268	171	389	9	758
8/18	1	3,178	19	47,870	40	19,308	94	483	6	764

-Continued-

Table 1. (page 2 of 2)

DATE	CHINOOK		SOCKEYE		CHUM		COHO		PINK	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
8/19	5	3,183	33	47,903	63	19,371	239	722	6	770
8/20	3	3,186	23	47,926	18	19,389	220	942	9	779
8/21	3	3,189	26	47,952	19	19,408	220	1,162	4	783
8/22	3	3,192	21	47,973	19	19,427	160	1,322	9	792
8/23	1	3,193	12	47,985	10	19,437	155	1,477	6	798
8/24	2	3,195	14	47,999	12	19,449	169	1,646	5	803
8/25	0	3,195	3	48,002	7	19,456	3	1,649	4	807
8/26	4	3,199	30	48,032	23	19,479	610	2,259	11	818
8/27	2	3,201	32	48,064	9	19,488	458	2,717	11	829
8/28	4	3,205	16	48,080	10	19,498	522	3,239	6	835
8/29	0	3,205	7	48,087	4	19,502	155	3,394	8	843
8/30	2	3,207	15	48,102	8	19,510	584	3,978	6	849
8/31	2	3,209	7	48,109	0	19,510	270	4,248	2	851
9/01	3	3,212	32	48,141	7	19,517	1,847	6,095	11	862
9/02	2	3,214	5	48,146	0	19,517	389	6,484	1	863
9/03	0	3,214	4	48,150	2	19,519	140	6,624	1	864
9/04	2	3,216	17	48,167	3	19,522	1,283	7,907	4	868
9/05	0	3,216	5	48,172	2	19,524	360	8,267	6	874
9/06	2	3,218	6	48,178	0	19,524	269	8,536	5	879
9/07	0	3,218	4	48,182	0	19,524	319	8,855	3	882
9/08	1	3,219	4	48,186	2	19,526	263	9,118	2	884
9/09	0	3,219	1	48,187	1	19,527	39	9,157	2	886
9/10	0	3,219	5	48,192	2	19,529	445	9,602	4	890
9/11	2	3,221	3	48,195	0	19,529	92	9,694	1	891
9/12	0	3,221	3	48,198	0	19,529	67	9,761	2	893
9/13	0	3,221	0	48,198	1	19,530	497	10,258	0	893
9/14 [d]	0	3,221	2	48,200	0	19,530	102	10,360	0	893
9/15	0	3,221	2	48,202	0	19,530	135	10,495	1	894
9/16 [e]	0	3,221	0	48,202	0	19,530	0	10,495	0	894
9/17	0	3,221	1	48,203	3	19,533	634	11,129	8	902
9/18	0	3,221	0	48,203	0	19,533	188	11,317	5	907
9/19	0	3,221	0	48,203	0	19,533	112	11,429	2	909
9/20	0	3,221	2	48,205	0	19,533	68	11,497	1	910
9/21	0	3,221	0	48,205	0	19,533	19	11,516	2	912
9/22	0	3,221	0	48,205	0	19,533	20	11,536	1	913
9/23	0	3,221	0	48,205	0	19,533	9	11,545	1	914
9/24	0	3,221	0	48,205	0	19,533	0	11,545	0	914
9/25	0	3,221	0	48,205	0	19,533	0	11,545	0	914
9/26	0	3,221	0	48,205	0	19,533	0	11,545	0	914

[a] Weir was fish tight at 1200. No estimate was made for fish passage before the weir was in operation.

[b] Hole in weir (because of weir panel being knocked ajar in late evening of July 8) for approximately 10 hours. No estimate of fish passage during time weir was not fish tight.

[c] Flooding knocked out the weir for 10 days. The weir was fish tight again at 1900 on August 14.

[d] Bear knocked down the trap with approximately 30 cohos released. These were not included in the escapement estimate.

[e] Bear knocked down the trap with approximately 15 cohos released. These were not included in the escapement estimate.

Table 2. Middle Fork Goodnews River estimated daily escapement of Dolly Varden, 1999.

Date	Daily	Cum	Date	Daily	Cum
7/04 [a]	2	2	8/20	4	1,714
7/05	3	5	8/21	4	1,718
7/06	1	6	8/22	6	1,724
7/07	0	6	8/23	5	1,729
7/08	0	6	8/24	4	1,733
7/09 [b]	1	7	8/25	1	1,734
7/10	2	9	8/26	4	1,738
7/11	5	14	8/27	6	1,744
7/12	6	20	8/28	3	1,747
7/13	7	27	8/29	3	1,750
7/14	12	39	8/30	7	1,757
7/15	22	61	8/31	0	1,757
7/16	60	121	9/01	4	1,761
7/17	25	146	9/02	2	1,763
7/18	33	179	9/03	2	1,765
7/19	20	199	9/04	6	1,771
7/20	60	259	9/05	0	1,771
7/21	48	307	9/06	5	1,776
7/22	90	397	9/07	1	1,777
7/23	138	535	9/08	0	1,777
7/24	267	802	9/09	1	1,778
7/25	92	894	9/10	5	1,783
7/26	50	944	9/11	3	1,786
7/27	108	1,052	9/12	0	1,786
7/28	108	1,160	9/13	0	1,786
7/29	168	1,328	9/14	1	1,787
7/30	31	1,359	9/15	1	1,788
7/31	122	1,481	9/16	0	1,788
8/01	43	1,524	9/17	8	1,796
8/02	104	1,628	9/18	1	1,797
8/03	54	1,682	9/19	0	1,797
8/04		1,682	9/20	0	1,797
8/14 [c]	0	1,682	9/21	0	1,797
8/15	5	1,687	9/22	0	1,797
8/16	2	1,689	9/23	2	1,799
8/17	4	1,693	9/24	0	1,799
8/18	11	1,704	9/25	0	1,799
8/19	6	1,710	9/26	0	1,799

[a] In 1999 the weir was "fish tight" on June 25 at 1200 hours. No Dolly Varden were believed to have passed before June 25 as the first Dolly Varden was not observed until July 4.

[b] Weir was not "fish tight" for several hours due to hole. No estimate was made for fish passage.

[c] Weir was not in operation from August 4 until 1900 hours August 14 because of flooding.

Table 3. Middle Fork Goodnews River daily carcass count at weir, 1999.

DATE	CHINOOK		SOCKEYE		CHUM		COHO		PINK		DOLLY		RAINBOW	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
6/30 [a]	0	0	1	1	1	1	0	0	0	0	0	0	0	0
7/01	0	0	1	2	0	1	0	0	0	0	0	0	0	0
7/02	0	0	0	2	0	1	0	0	0	0	0	0	0	0
7/03	0	0	0	2	0	1	0	0	0	0	0	0	0	0
7/04	0	0	0	2	0	1	0	0	0	0	0	0	0	0
7/05	0	0	0	2	0	1	0	0	0	0	0	0	0	0
7/06	0	0	0	2	0	1	0	0	0	0	0	0	0	0
7/07	0	0	1	3	0	1	0	0	0	0	0	0	0	0
7/08	0	0	1	4	0	1	0	0	0	0	0	0	0	0
7/09	0	0	1	5	0	1	0	0	0	0	1	1	0	0
7/10	0	0	1	6	1	2	0	0	0	0	1	2	0	0
7/11	1	1	1	7	0	2	0	0	0	0	0	2	0	0
7/12	0	1	1	8	0	2	0	0	0	0	0	2	0	0
7/13	0	1	0	8	1	3	0	0	0	0	0	2	0	0
7/14	0	1	0	8	0	3	0	0	0	0	0	2	0	0
7/15	0	1	1	9	2	5	0	0	0	0	0	2	0	0
7/16	0	1	1	10	3	8	0	0	0	0	0	2	1	1
7/17	0	1	1	11	5	13	0	0	0	0	0	2	0	1
7/18	0	1	0	11	5	18	0	0	0	0	0	2	0	1
7/19	0	1	0	11	6	24	0	0	0	0	0	2	0	1
7/20	0	1	2	13	16	40	0	0	0	0	0	2	0	1
7/21	0	1	1	14	12	52	0	0	0	0	0	2	0	1
7/22	0	1	3	17	19	71	0	0	0	0	0	2	0	1
7/23		1		17		71		0		0		2		1
7/24	1	2	3	20	27	98	0	0	0	0	0	2	0	1
7/25	3	5	5	25	38	136	0	0	0	0	0	2	0	1
7/26	0	5	2	27	30	166	0	0	0	0	0	2	0	1
7/27		5		27		166		0		0		2		1
7/28	0	5	1	28	33	199	0	0	0	0	0	2	0	1
7/29	1	6	0	28	22	221	0	0	0	0	0	2	0	1
7/30	1	7	1	29	33	254	0	0	0	0	0	2	0	1
7/31	0	7	4	33	51	305	0	0	0	0	1	3	0	1
8/01		7		33		305		0		0		3		1
8/02	3	10	2	35	134	439	0	0	0	0	0	3	0	1
8/03	1	11	3	38	102	541	0	0	0	0	0	3	0	1
8/04 [b]		11		38		541		0		0		3		1
8/14	0	11	0	38	0	541	0	0	0	0	0	3	0	1
8/15	4	15	4	42	49	590	0	0	1	1	0	3	0	1
8/16	16	31	6	48	55	645	0	0	5	6	0	3	0	1
8/17	3	34	0	48	23	668	0	0	2	8	0	3	0	1
8/18	23	57	6	54	123	791	0	0	20	28	1	4	0	1
8/19	3	60	3	57	39	830	0	0	7	35	2	6	0	1
8/20	15	75	5	62	59	889	0	0	10	45	0	6	0	1
8/21	17	92	7	69	48	937	0	0	15	60	0	6	0	1
8/22	16	108	24	93	100	1,037	0	0	19	79	1	7	0	1
8/23	14	122	2	95	47	1,084	0	0	5	84	0	7	0	1
8/24	10	132	1	96	61	1,145	0	0	7	91	0	7	0	1
8/25	16	148	3	99	70	1,215	0	0	9	100	0	7	0	1
8/26	14	162	1	100	50	1,265	0	0	6	106	0	7	0	1
8/27	17	179	4	104	50	1,315	0	0	11	117	0	7	0	1
8/28	10	189	3	107	35	1,350	1	1	7	124	0	7	0	1

-Continued-

Table 3. (page 2 of 2)

DATE	CHINOOK		SOCKEYE		CHUM		COHO		PINK		DOLLY		RAINBOW	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
8/29		189		107		1,350		1		124		7		1
8/30	6	195	12	119	30	1,380	2	3	6	130	0	7	0	1
8/31	7	202	10	129	38	1,418	1	4	5	135	0	7	0	1
9/01	5	207	9	138	28	1,446	1	5	3	138	0	7	0	1
9/02	6	213	7	145	21	1,467	0	5	0	138	0	7	0	1
9/03	3	216	5	150	25	1,492	1	6	1	139	0	7	0	1
9/04	4	220	8	158	14	1,506	0	6	2	141	1	8	0	1
9/05	4	224	7	165	9	1,515	0	6	2	143	0	8	0	1
9/06	0	224	4	169	2	1,517	0	6	1	144	0	8	0	1
9/07	3	227	10	179	8	1,525	0	6	3	147	0	8	0	1
9/08	1	228	4	183	6	1,531	0	6	1	148	0	8	0	1
9/09	0	228	10	193	2	1,533	1	7	0	148	0	8	0	1
9/10	0	228	4	197	3	1,536	2	9	2	150	0	8	0	1
9/11	0	228	5	202	0	1,536	0	9	0	150	0	8	0	1
9/12	0	228	4	206	1	1,537	2	11	2	152	1	9	0	1
9/13	0	228	2	208	0	1,537	0	11	1	153	0	9	0	1
9/14	0	228	0	208	0	1,537	0	11	0	153	0	9	0	1
9/15	0	228	8	216	0	1,537	1	12	1	154	0	9	0	1
9/16	0	228	0	216	0	1,537	0	12	0	154	0	9	0	1
9/17	0	228	1	217	1	1,538	1	13	1	155	0	9	0	1
9/18	0	228	0	217	0	1,538	0	13	0	155	0	9	0	1
9/19	0	228	0	217	1	1,539	1	14	1	156	0	9	0	1
9/20	0	228	1	218	0	1,539	1	15	1	157	0	9	0	1
9/21	0	228	4	222	0	1,539	0	15	0	157	0	9	0	1
9/22	0	228	1	223	0	1,539	0	15	0	157	0	9	0	1
9/23	0	228	0	223	0	1,539	4	19	1	158	0	9	0	1
9/24	0	228	2	225	0	1,539	0	19	0	158	0	9	0	1
9/25	0	228	0	225	0	1,539	0	19	0	158	0	9	0	1
9/26 [c]	0	228	0	225	0	1,539	0	19	0	158	0	9	0	1

[a] Weir installed and "fish tight" on June 25 at 1200 hours. The first dead fish was observed on June 30. On days where no carcass count occurred there is a blank space. Carcasses from that day would have been counted in the following days total.

[b] Weir flooded out in early morning of August 4 and was not "fish tight" until 1900 hours on August 14.

[c] Weir removed on September 26 at 1800 hours.

Table 4. Age and sex composition of Middle Fork Goodnews River weir sockeye salmon escapement samples, 1999.

		Brood Year and Age Group [a]								
		1995		1994			1993		1992	Total
		0.3	1.2	0.4	1.3	2.2	1.4	2.3	2.4	
Stratum Dates:	6/25 - 7/3									
Sampling Dates:	6/29 - 6/30									
Sample Size:	183									
Male	Percent of Sample	1.1	2.8	0.0	50.3	0.0	3.8	2.2	0.0	60.1
	Number in Escapement	93	232	0	4,271	0	325	186	0	5,107
Female	Percent of Sample	0.5	4.9	0.5	32.2	0.0	1.1	0.5	0.0	39.9
	Number in Escapement	46	418	46	2,739	0	93	46	0	3,389
Total	Percent of Sample	1.6	7.7	0.5	82.5	0.0	4.9	2.7	0.0	100.0
	Number in Escapement	139	650	46	7,010	0	418	232	0	8,496
Stratum Dates:	7/4 - 7/10									
Sampling Dates:	7/6 - 7/8									
Sample Size:	184									
Male	Percent of Sample	0.0	6.0	0.0	41.3	0.0	1.1	2.2	0.0	50.5
	Number in Escapement	0	1,075	0	7,426	0	195	391	0	9,087
Female	Percent of Sample	1.1	7.0	0.0	37.0	1.1	0.5	2.1	0.5	49.5
	Number in Escapement	195	1,270	0	6,645	195	98	391	98	8,892
Total	Percent of Sample	1.1	13.0	0.0	78.3	1.1	1.6	4.3	0.5	100.0
	Number in Escapement	195	2,345	0	14,071	195	293	782	98	17,979
Stratum Dates:	7/11 - 7/18									
Sampling Dates:	7/12 - 7/13, 7/15									
Sample Size:	181									
Male	Percent of Sample	0.6	3.3	0.6	41.4	1.1	0.6	2.2	0.0	49.7
	Number in Escapement	73	439	73	5,491	147	73	293	0	6,590
Female	Percent of Sample	0.5	5.0	0.0	36.5	3.3	0.0	5.0	0.0	50.3
	Number in Escapement	73	659	0	4,833	439	0	659	0	6,663
Total	Percent of Sample	1.1	8.3	0.6	77.9	4.4	0.6	7.2	0.0	100.0
	Number in Escapement	146	1,098	73	10,324	586	73	952	0	13,253
Stratum Dates:	7/19 - 7/26									
Sampling Dates:	7/22 - 7/23									
Sample Size:	175									
Male	Percent of Sample	0.0	9.7	0.0	36.6	0.0	0.0	4.0	0.6	50.9
	Number in Escapement	0	617	0	2,324	0	0	254	36	3,232
Female	Percent of Sample	1.1	8.6	0.0	34.8	2.3	0.6	1.7	0.0	49.1
	Number in Escapement	73	545	0	2,216	145	36	109	0	3,124
Total	Percent of Sample	1.1	18.3	0.0	71.4	2.3	0.6	5.7	0.6	100.0
	Number in Escapement	73	1,162	0	4,540	145	36	363	36	6,356

- Continued -

Table 4. (page 2 of 2)

		Brood Year and Age Group [a]								
		1995		1994			1993		1992	Total
		0.3	1.2	0.4	1.3	2.2	1.4	2.3	2.4	
Stratum Dates:	7/27 - 9/26 [b]									
Sampling Dates:	7/29 - 7/30									
Sample Size:	66									
Male	Percent of Sample	0.0	4.6	0.0	33.4	0.0	0.0	3.1	0.0	40.9
	Number in Escapement	0	96	0	707	0	0	65	0	868
Female	Percent of Sample	1.5	10.6	0.0	42.4	1.5	0.0	3.0	0.0	59.1
	Number in Escapement	32	225	0	900	32	0	64	0	1,253
Total	Percent of Sample	1.5	15.2	0.0	75.8	1.5	0.0	6.1	0.0	100.0
	Number in Escapement	32	321	0	1,607	32	0	129	0	2,121
Strata Dates:	Season [c]									
Sample Size:	789									
Male	Percent of Sample	0.3	5.1	0.1	41.9	0.3	1.2	2.5	0.1	51.6
	Number in Escapement	166	2,460	73	20,220	147	594	1,188	36	24,884
Female	Percent of Sample	0.9	6.5	0.1	36.0	1.7	0.5	2.6	0.2	48.4
	Number in Escapement	420	3,117	47	17,332	812	227	1,269	98	23,321
Total	Percent of Sample	1.2	11.6	0.2	77.9	2.0	1.7	5.1	0.3	100.0
	Number in Escapement	586	5,577	120	37,552	959	821	2,457	134	48,205

[a] The number of fish in each stratum age and sex category are derived from the sample percentages; discrepancies in sums are attributed to rounding.

[b] Flooding knocked out the weir from August 4 until August 14 and no estimates were made for escapement during this time period.

[c] The number of fish in the "Season" summary are the stratum sums. "Season" percentages are derived from the sums.

Table 5. Length (mm measured from mid-orbit to fork-of-tail) by age and sex of Middle Fork Goodnews River sockeye salmon escapement samples captured in weir trap, 1999.

		Brood Year and Age Group							
		1995		1994			1993		1992
		0.3	1.2	0.4	1.3	2.2	1.4	2.3	2.4
Sample Dates:	6/29 - 6/30								
Sample Size:	183								
Male	Mean Length	598	530	-	593	-	591	586	-
	Std. Error	3	11	-	2	-	4	2	-
	Range	595-600	495-555	-	545-625	-	575-610	580-590	-
	Sample Size	2	5	0	92	0	7	4	0
Female	Mean Length	560	516	560	546	-	570	545	-
	Std. Error	-	8	-	3	-	20	-	-
	Range	560-560	480-545	560-560	505-610	-	550-590	545-545	-
	Sample Size	1	9	1	59	0	2	1	0
Sample Dates:	7/6 - 7/8								
Sample Size:	184								
Male	Mean Length	-	513	-	572	-	573	559	-
	Std. Error	-	8	-	3	-	8	11	-
	Range	-	460-545	-	475-620	-	565-580	535-580	-
	Sample Size	0	11	0	76	0	2	4	0
Female	Mean Length	550	489	-	533	470	520	533	565
	Std. Error	45	7	-	3	5	-	15	-
	Range	505-595	465-535	-	465-580	465-475	520-520	505-575	565-565
	Sample Size	2	13	0	68	2	1	4	1
Sample Dates:	7/12 - 7/13, 7/15								
Sample Size:	181								
Male	Mean Length	560	528	560	575	513	605	541	-
	Std. Error	-	13	-	2	13	-	31	-
	Range	560-560	500-585	560-560	530-610	500-525	605-605	450-580	-
	Sample Size	1	6	1	75	2	1	4	0
Female	Mean Length	545	486	-	535	481	-	526	-
	Std. Error	-	8	-	2	8	-	5	-
	Range	545-545	450-525	-	500-580	465-515	-	505-545	-
	Sample Size	1	9	0	66	6	0	9	0
Sample Dates:	7/22 - 7/23								
Sample Size:	175								
Male	Mean Length	-	496	-	555	-	-	550	555
	Std. Error	-	7	-	3	-	-	10	-
	Range	-	430-545	-	500-605	-	-	525-580	555-555
	Sample Size	0	17	0	64	0	0	7	1
Female	Mean Length	515	493	-	527	509	535	530	-
	Std. Error	5	7	-	3	7	-	6	-
	Range	510-520	455-565	-	485-575	490-525	535-535	520-540	-
	Sample Size	2	15	0	61	4	1	3	0

-Continued-

Table 5. (page 2 of 2).

		Brood Year and Age Group							
		1995		1994			1993		1992
		0.3	1.2	0.4	1.3	2.2	1.4	2.3	2.4
Sample Dates:	7/29 - 7/30								
Sample Size:	66								
Male	Mean Length	-	517	-	566	-	-	533	-
	Std. Error	-	20	-	4	-	-	18	-
	Range	-	480-550	-	525-590	-	-	515-550	-
	Sample Size	0	3	0	22	0	0	2	0
Female	Mean Length	490	481	-	530	475	-	533	-
	Std. Error	-	7	-	5	-	-	3	-
	Range	490-490	455-500	-	475-590	475-475	-	530-535	-
	Sample Size	1	7	0	28	1	0	2	0
Sample Dates:	Season [a]								
Sample Size:	789								
Male	Mean Length	581	513	560	575	513	586	555	555
	Range	560-600	430-585	560-560	475-625	500-525	565-610	450-590	555-555
	Sample Size	3	42	1	329	2	10	21	1
Female	Mean Length	540	492	560	535	483	543	529	565
	Range	490-595	450-565	560-560	465-610	465-525	520-590	505-575	565-565
	Sample Size	7	53	1	282	13	4	19	1

[a] Season mean lengths are weighted by the escapement passage in each stratum.

Table 6. Age and sex composition of Middle Fork Goodnews River weir chum salmon escapement samples, 1999.

		Brood Year and Age Group [a]				
		1996	1995	1994	1993	Total
		0.2	0.3	0.4	0.5	
Stratum Dates :	6/25 - 7/15					
Sampling Dates:	7/8 - 7/11, 7/13					
Sample Size:	275					
Male	Percent of Sample	0.0	32.0	23.3	0.4	55.6
	Number in Escapement	0	2,318	1,686	26	4,030
Female	Percent of Sample	0.0	25.1	19.2	0.0	44.4
	Number in Escapement	0	1,817	1,396	0	3,213
Total	Percent of Sample	0.0	57.1	42.5	0.4	100.0
	Number in Escapement	0	4,135	3,082	26	7,243
Stratum Dates:	7/16 - 7/23					
Sampling Dates:	7/18 - 7/20					
Sample Size:	194					
Male	Percent of Sample	0.0	24.7	17.0	0.5	42.3
	Number in Escapement	0	1,386	953	29	2,368
Female	Percent of Sample	0.0	41.8	16.0	0.0	57.7
	Number in Escapement	0	2,340	895	0	3,235
Total	Percent of Sample	0.0	66.5	33.0	0.5	100.0
	Number in Escapement	0	3,726	1,848	29	5,603
Stratum Dates:	7/24 - 9/26 [b]					
Sampling Dates:	7/26 - 7/27, 7/29					
Sample Size:	203					
Male	Percent of Sample	0.0	38.4	12.3	0.0	50.7
	Number in Escapement	0	2,569	824	0	3,393
Female	Percent of Sample	0.0	35.0	14.3	0.0	49.3
	Number in Escapement	0	2,339	955	0	3,294
Total	Percent of Sample	0.0	73.4	26.6	0.0	100.0
	Number in Escapement	0	4,908	1,779	0	6,687
Strata Dates:	Season [c]					
Sample Size:	672					
Male	Percent of Sample	0.0	32.1	17.7	0.3	50.1
	Number in Escapement	0	6,273	3,462	55	9,791
Female	Percent of Sample	0.0	33.3	16.6	0.0	49.9
	Number in Escapement	0	6,496	3,247	0	9,742
Total	Percent of Sample	0.0	65.4	34.3	0.3	100.0
	Number in Escapement	0	12,769	6,709	55	19,533

[a] The number of fish in each stratum age and sex category are derived from the sample percentages; discrepancies in sums are attributed to rounding.

[b] Flooding knocked out the weir from August 4 until August 14 and no estimates were made for escapement.

[c] The number of fish in the "Season" summary are the stratum sums. "Season" percentages are derived from the sums.

Table 7. Length (mm measured from mid-orbit to fork-of-tail) by age and sex of Middle Fork Goodnews River chum salmon escapement samples captured in weir trap, 1999.

		Brood Year and Age Group			
		1996	1995	1994	1993
		0.2	0.3	0.4	0.5
Sample Dates:	7/8 - 7/11, 7/13				
Sample Size:	275				
Male	Mean Length	-	607	632	605
	Std. Error	-	3	4	-
	Range	-	500-675	555-690	605-605
	Sample Size	0	88	64	1
Female	Mean Length	-	576	585	-
	Std. Error	-	2	3	-
	Range	-	535-615	540-625	-
	Sample Size	0	69	53	0
Sample Dates:	7/18 - 7/20				
Sample Size:	194				
Male	Mean Length	-	599	606	615
	Std. Error	-	4	5	-
	Range	-	550-635	535-665	615-615
	Sample Size	0	48	33	1
Female	Mean Length	-	566	597	-
	Std. Error	-	2	4	-
	Range	-	510-615	560-675	-
	Sample Size	0	81	31	0
Sample Dates:	7/26 - 7/27, 7/29				
Sample Size:	203				
Male	Mean Length	-	588	606	-
	Std. Error	-	3	8	-
	Range	-	525-665	540-675	-
	Sample Size	0	78	25	0
Female	Mean Length	-	550	558	-
	Std. Error	-	3	4	-
	Range	-	475-615	510-600	-
	Sample Size	0	71	29	0
Sample Dates:	Season [a]				
Sample Size:	672				
Male	Mean Length	-	597	619	610
	Range	-	500-675	535-690	605-615
	Sample Size	0	214	122	2
Female	Mean Length	-	563	581	-
	Range	-	475-615	510-675	-
	Sample Size	0	221	113	0

[a] Season mean lengths are weighted by the catch in each stratum.

Table 8. Age and sex composition of Middle Fork Goodnews River weir coho salmon escapement samples, 1999.

		Brood Year and Age Group [a]			
		1996	1995	1994	Total
		1.1	2.1	3.1	
Stratum Dates: 8/14 - 8/27					
Sampling Dates: 8/23 - 8/24					
Sample Size: 64					
Male	Percent of Sample	6.2	35.9	0.0	42.2
	Number in Escapement	170	976	0	1,146
Female	Percent of Sample	4.7	51.6	1.6	57.8
	Number in Escapement	127	1,401	42	1,571
Total	Percent of Sample	10.9	87.5	1.6	100.0
	Number in Escapement	297	2,377	42	2,717
Stratum Dates: 8/28 - 9/3					
Sampling Dates: 8/30 - 9/2					
Sample Size: 140					
Male	Percent of Sample	3.6	35.7	0.7	40.0
	Number in Escapement	140	1,395	28	1,563
Female	Percent of Sample	4.3	55.0	0.7	60.0
	Number in Escapement	167	2,149	28	2,344
Total	Percent of Sample	7.9	90.7	1.4	100.0
	Number in Escapement	307	3,544	56	3,907
Stratum Dates: 9/4 - 9/11					
Sampling Dates: 9/5, 9/7 - 9/8					
Sample Size: 142					
Male	Percent of Sample	5.7	44.4	2.8	52.8
	Number in Escapement	173	1,362	86	1,621
Female	Percent of Sample	5.6	40.8	0.7	47.2
	Number in Escapement	173	1,254	22	1,449
Total	Percent of Sample	11.3	85.2	3.5	100.0
	Number in Escapement	346	2,616	108	3,070
Stratum Dates: 9/12 - 9/26					
Sampling Date: 9/15					
Sample Size: 65					
Male	Percent of Sample	9.2	30.8	1.5	41.5
	Number in Escapement	171	569	28	769
Female	Percent of Sample	1.6	56.9	0.0	58.5
	Number in Escapement	28	1,054	0	1,082
Total	Percent of Sample	10.8	87.7	1.5	100.0
	Number in Escapement	199	1,623	28	1,851

- Continued -

Table 8. (page of 2 of 2)

		Brood Year and Age Group [a]			
		1996	1995	1994	Total
		1.1	2.1	3.1	
Sample Dates:	Season [b]				
Sample Size:	411				
Male	Percent of Sample	5.7	37.3	1.2	44.2
	Number in Escapement	653	4,303	143	5,099
Female	Percent of Sample	4.3	50.7	0.8	55.8
	Number in Escapement	496	5,858	92	6,446
Total	Percent of Sample	10.0	88.0	2.0	100.0
	Number in Escapement	1,149	10,161	235	11,545

[a] The number of fish in each stratum age and sex category are derived from the sample percentages; discrepancies in sums are attributed to rounding.

[b] The number of fish in "Season" summaries are the strata sums; "Season" percentages are derived from the sums.

Table 9. Length (mm measured from mid-orbit to fork-of-tail) by age and sex of Middle Fork Goodnews River coho salmon escapement samples captured in weir trap, 1999.

		Brood Year and Age Group		
		1996	1995	1994
		1.1	2.1	3.1
Sample Dates:	8/23 - 8/24			
Sample Size:	64			
Male	Mean Length	525	558	-
	Std. Error	34	10	-
	Range	470-610	460-640	-
	Sample Size	4	23	0
Female	Mean Length	547	578	575
	Std. Error	11	5	-
	Range	525-560	500-610	575-575
	Sample Size	3	33	1
Sample Dates:	8/30 - 9/2			
Sample Size:	140			
Male	Mean Length	558	586	595
	Std. Error	15	7	-
	Range	520-610	455-680	595-595
	Sample Size	5	50	1
Female	Mean Length	571	589	625
	Std. Error	9	4	-
	Range	545-600	500-650	625-625
	Sample Size	6	77	1
Sample Dates:	9/5, 9/7 - 9/8			
Sample Size:	142			
Male	Mean Length	589	617	631
	Std. Error	23	7	17
	Range	467-658	460-707	588-668
	Sample Size	8	63	4
Female	Mean Length	579	603	591
	Std. Error	18	5	-
	Range	518-677	495-668	591-591
	Sample Size	8	58	1
Sample Date:	9/15			
Sample Size:	65			
Male	Mean Length	565	612	675
	Std. Error	10	7	-
	Range	525-595	550-665	675-675
	Sample Size	6	20	1
Female	Mean Length	595	600	-
	Std. Error	-	6	-
	Range	595-595	510-655	-
	Sample Size	1	37	0

- Continued -

Table 9. (page 2 of 2)

		Brood Year and Age Group		
		1996	1995	1994
		1.1	2.1	3.1
Sample Dates:	Season [a]			
Sample Size:	411			
Male	Mean Length	560	593	633
	Range	467-658	455-707	588-675
	Sample Size	23	156	6
Female	Mean Length	569	591	594
	Range	518-677	495-668	575-625
	Sample Size	18	205	3

[a] Season mean lengths are weighted by the catch in each stratum.

Table 10. Middle Fork Goodnews River meteorological and hydrological observations, 1999.

	0800 Weather						2000 Weather						Daily Conditions		
				Temperature (F) Water						Temperature (F) Water			Air		Precip.
Date	Sky[a]	Wind (kts)	Precip.[b]	Air	Water	Lev. (in)[c]	Sky[a]	Wind (kts)	Precip.[b]	Air	Water	Lev. (in)[c]	Min	Max	(mm)
6/04	3	W 10	1				3	W 10	1						
6/05	4	W 10	1				4	SW 10	1	44					
6/06	4	E 15	1	48		27.00	4	SE 25	3	45		27.00	43	53	trace
6/07	5	Calm	3	43	42	30.00	4	Calm	3	44	42	32.00	41	58	2.5
6/08	4	Calm	1	45	40	32.00	3	SW 10	1	55	40	31.50	43	59	0.0
6/09	4	NE 5	3	43	40	29.50	4	SE 10	3	48	41	27.50	39	55	2.0
6/10	4	SE 20	2	47	40	29.00	4	SE 15	2	49	42	34.00	45	54	2.7
6/11	4	E 10	4	45	42	35.00	4	SW 5	4	43	44	34.50	43	49	3.0
6/12	4	Calm	3	44	41	36.00	4	NE 5	1	57	42	34.00	38	60	1.8
6/13	4	NE 5	1	54	40	33.00	3	Calm	1	70	45	31.00	44	76	trace
6/14	3	E 10	1	56	44	30.50	3	E 12	2	56	46	30.00	48	72	0.3
6/15	4	Calm	1	49	44	30.50	3	N 3	2	58	47	30.00	46	77	1.5
6/16	3	Calm	1	52			3	W 10	1	55	47	27.50	48	71	0.6
6/17	2	Calm	1	45	45	27.00	3	NE 5	1	56	48	26.00	40	75	trace
6/18	4	Calm	1	50	45	25.50	3	W 5	1	55	45	25.00	42	67	trace
6/19	3	SE 5	1	56	45	25.00	3	S 5	2	53			44	69	5.3
6/20	4	NE 5	2	49	47	24.50	3	W 5	1	60	44	23.00	36	67	0.5
6/21	4	Calm	1	47	44	22.00	4	SW 5	2	51	45	21.00	40	68	2.2
6/22	4	Calm	1	45	45	20.00	2	SW 15	1	53	49	19.00	43	63	0.0
6/23	4	W 5	1	47	46	18.50	2	SW 10	1	49	49	18.00	41	70	trace
6/24	3	NE 5	1	43	46	17.50	4	SW 5	1	51	46	18.00	36	58	0.7
6/25	4	Calm	1	47	44	18.00	4	Calm	2	50	46	17.50	40	60	0.7
6/26	4	Calm	1	50	44	17.25	3	SW 5	2	52			41	54	1.5
6/27	3	Calm	1	46	44	16.50	3	SW 10	1	61	49	15.75	39	69	0.0
6/28	3	Calm	1	45	44	15.50	3	W 5-10	1	55	48	15.25	32	65	2.7
6/29	3	Calm	1	44	44	15.00	3	SSE 5-10	1	60	51	15.00	45	71	0.0
6/30	5	Calm	1	44	48	15.00	3	SW 15	1	54	50	14.75	39	61	0.0
7/01	4	W 5-10	1	41	48	14.00	3	W 10-15	1	57	51	13.75	41	58	0.0
7/02	3	W 0-5	1	43	49	13.50	3	W 0-5	1	52	50	13.25	38	57	0.0
7/03	4	W 0-3	1	46	51	13.00	2	NNW 0-3	1	62	54	12.75	38	63	0.0
7/04	2	W 0-3	1	51	48	12.50	3	SW 10-15	1	50	54	12.00	40	65	0.0
7/05	4	W 5-7	1	49	48	12.00	4	W 5	1	46	48	11.75	37	51	0.5
7/06	4	Calm	1	56	48	11.25	3	SE 5-10	1	70	55	11.00	45	61	0.0
7/07	1	Calm	1	62	50	11.00	1	SW 3-5	1	60	58	10.50	44	64	0.0
7/08	1	SE 5	1	54	50	10.25	3	SW 10-15	1	56	54	10.00	38	74	0.0
7/09	4	Calm	2	50	52	9.75	3	W 0-5	2	55	54	9.75	41	73	2.5
7/10	4	Calm	2	52	50	9.50	2	Calm	1	53	54	9.25	37	74	0.6
7/11	2	NE 0-5	1	49	50	9.00	2	W 5-10	1	52	54	9.00	40	72	0.8
7/12	3	Calm	1	53	53	8.75	3	E 0-3	1	49	54	8.50	40	76	0.4
7/13	4	NE 5-10	2	50	50	8.50	4	W 10-15	2	53	51	8.25	39	59	0.1
7/14	4	SW 5-10	2	51	50	8.25	4	S 5-10	2	51	51	8.25	41	64	1.3
7/15	5	S 5-10	3	47	49	8.50	5	S 5-10	3	47	50	8.25	44	55	1.1
7/16	5	Calm	2	48	50	8.25					49	8.25			
7/17	5	S 0-5	2		47	8.25	3	S 10	1	60	50	8.00	44	70	trace
7/18	4	S 5	2	50	50	8.50	4	Calm	3	56	52	8.50	50	62	9.7
7/19	4	Calm	3	48	50	8.75	4	S 25	2	50	48	9.25	45	53	16.0
7/20	4	SW 10	3	45	46	10.00	4	SW 10	3	46	48	11.00	43	50	0.9
7/21	4	SW 10	3	46	46	10.50									
7/22	3	E 5	1	40	46	9.50	4	SE 5	1	50	48	9.25	30	59	0.5
7/23	4	Calm	2	50	47	9.00	3	S 5	2	60	48	9.00	47	62	4.3

-Continued-

Table 10. (page 2 of 3)

	0800 Weather						2000 Weather						Daily Conditions		
				Temperature (F) Water						Temperature (F) Water			Air		Precip.
Date	Sky[a]	Wind (kts)	Precip.[b]	Air	Water	Lev. (in)[c]	Sky[a]	Wind (kts)	Precip.[b]	Air	Water	Lev. (in)[c]	Min	Max	(mm)
7/24	4	Calm	1	60	48	9.00	4	W 10	2	52	51	9.00	50	63	1.5
7/25	4	W 10	3	48	49	9.00	4	W 5	2	50	47	9.00	45	55	4.7
7/26	4	SW 5	3	45	46	9.25	4	SW 10	2	48	48	9.00	43	53	1.9
7/27	4	W 10	1	45	46	9.00	3	W 5	1	45	48	9.00	44	52	1.0
7/28	4	Calm	3	46	48	9.00	4	SW 10-15	2	54	47	9.25	42	56	11.0
7/29	4	SW 5-10	2	44	47	9.50	4	W 5-10	1	48	48	11.00	43	56	5.3
7/30	4	S 5-10	2	46	46	11.50	3	S 15-20	1	56	46	10.50	42	60	0.0
7/31	4	SW 10-15	1	48	48	10.00	4	SW 10-15	1	47	48	9.50	40	52	0.0
8/01	4	Calm	3	46	47	9.25	4	S 0-5	1	51	47	9.00	43	61	0.8
8/02	4	Calm	1	42	47	9.00	3	E 10-15	1	59	50	9.00	43	63	0.6
8/03	4	SE 30-35	4	54	50	8.75	4	SE 20-35	4	57	53	11.75	52	58	24.0
8/04	4	SE 20-35	4	52	48	26.00	4	SE 20-30	2	50	52	40+	50	57	14.0
8/05	4	SE 10-15	1	50		45+	3	SE 10-15	1	52	51	50+	46	64	1.8
8/06	4	S 5-10	2	47	48	45+	5	Calm	3	47	46	45+	46	55	1.5
8/07	3	Calm	1	50	47	42.00	4	Calm	1	49	47	37.50	49	55	trace
8/08	5	Calm	3	47	47	34.50	3	Calm	1	55	47	31.50	39	60	trace
8/09	4	E 5	1	49	48	29.00	4	SE 10	2	52	49	27.00	37	59	0.5
8/10	4	S 10	1	49	48	26.00	4	S 5	2	51	49	24.50	48	54	0.6
8/11	4	Calm	4	50	46	24.25	4	Calm	2	54	49	23.75	48	58	19.8
8/12	5	Calm	3	49	48	24.50	4	NW 10	1	52	49	23.50	49	56	3.6
8/13	3	Calm	1	48	48	22.50	3	NW 0-5	1	48	48	21.00	39	61	trace
8/14	4	Calm	2	46	48	20.50	4	NW 0-5	2	51	48	19.75	44	55	trace
8/15	3	NW 10	1	50	48	19.00	3	N 10	1	55	48	18.50	44	63	0.0
8/16	2	Calm	1	43	47	18.00							37	71	0.0
8/17	5	Calm	1	36	46	16.75	3	SW 10	1	48	47	16.00	29	72	0.0
8/18	5	Calm	3	47	49	15.50	3	S 10	1	50	50	15.00	46	68	0.0
8/19	4	SE 5	2	49	50	14.50	3	SW 5	1	52	49	17.75	47	54	19.8
8/20	4	Calm	1	44	47	22.00	3	S 5	1	51	47	20.00	43	56	0.0
8/21	4	Calm	1	48	46	18.00	2	Calm	1	46	48	17.25	44	58	0.3
8/22	4	Calm	2	48	47	16.75	2	SW 10	1	56	49	15.00	41	68	0.0
8/23	3	Calm	1	43	48	15.00	3	Calm	2	49	50	16.00	36	64	8.2
8/24	2	Calm	1	45	47	17.50	2	SW 10	1	56	50	17.25	43	67	0.3
8/25	3	Calm	2	49	47	16.00							44	61	trace
8/26	4	Calm	1	44	47	14.50	3	Calm	2	50	48	14.00	43	63	1.3
8/27	5	Calm	1	31	46	14.50	1	W 5	1	62	49	14.00	30	63	0.0
8/28	5	Calm	3	43	48	13.50	5	SW 5	3	49	51	13.25	34	66	0.0
8/29	4	Calm	1	44	49	13.00	4	Calm	3	49	48	13.00	40	52	3.2
8/30	4	Calm	3	47	47	13.00	4	Calm	3	48	46	13.00	46	52	3.1
8/31	4	Calm	1	44	46	13.00	4	SE 20	2	51	46	13.00	32	53	6.5
9/01	4	S 15	2	48	46	13.00	4	SW 10	2	47	47	13.50	46	55	4.5
9/02	4	Calm	1	43	46	14.00	4	SW 10	2	46	46	13.75	43	49	5.1
9/03	4	Calm	2	45	46	13.50	4	SW 5	3	46	46	13.50	44	50	12.8
9/04	4	Calm	2	42	45	15.00	3	W 5	1	50	47	15.50	41	59	0.3
9/05	4	Calm	1	47	46	15.00	3	N 10	1	51	46	14.50	42	58	0.0
9/06	3	Calm	1	43	46	13.75	2	N 5	1	54	48	13.25	37	61	0.0
9/07	1	Calm	1	46	46	13.00	2	SW 10	1	52	46	12.75	32	62	0.0
9/08	5	Calm	3	40	46	12.50	3	SW 5	2	50	46	12.50	35	63	0.6
9/09	2	Calm	1	31	45	12.25	2	NE 5	2	48	45	12.25	31	69	trace
9/10	1	Calm	1	27	44	12.00	1	N 5	1	60	45	11.50	27	72	0.0
9/11	1	Calm	1	30	45	11.25	1	NE 10	1	60	46	11.00	29	66	0.0
9/12	2	Calm	1	34	46	10.75	2	SE 5	1	60	46	11.00	34	64	1.5

-Continued-

Table 10. (page 3 of 3)

	0800 Weather						2000 Weather						Daily Conditions		
				Temperature (F) Water						Temperature (F) Water			Air		
Date	Sky[a]	Wind (kts)	Precip.[b]	Air	Water	Lev. (in)[c]	Sky[a]	Wind (kts)	Precip.[b]	Air	Water	Lev. (in)[c]	Min	Max	Precip. (mm)
9/13	5	Calm	1	33	46	11.00	2	S 5	1	58	46	11.00	32	62	0.0
9/14	4	Calm	4	40	43	11.00	4	W 5	1	48	45	10.75	32	49	9.1
9/15	4	Calm	1	43	43	10.75	3	S 3	1	43	45	10.50	32	56	trace
9/16	4	E 10	1	46	44	10.25	4	E 10	4	46	45	10.25	27	52	9.1
9/17	4	Calm	4	48	46	11.50	4	Calm	4	48	48	14.00	40	52	14.3
9/18	4	Calm	2	46	46	15.00	4	SSE 6	4	47	46	14.75	43	50	14.4
9/19	4	E 5	4	46	46	16.50	3	E 0-5	2	48	47	21.50	45	53	2.2
9/20	4	E 0-3	2	44	46	23.00	3	S 0-5	2	48	46	23.00	44	52	0.8
9/21	4	E 3-5	2	44	46	23.50	3	Calm	1	48	48	23.75	41	56	3.1
9/22	2	N 10	1	47	44	23.75	3	N 10-15	2	50	47	23.50	38	58	0.5
9/23	4	Calm	1	45	45	23.00	3	N 5-10	2	44	46	21.75	37	52	0.4
9/24	4	Calm	2	40	43	21.00	3	SW 5	2	44	44	20.50	34	51	1.8
9/25	3	Calm	1	32	42	20.00	3	W 0-5	2	44	44	19.00	29	52	1.3
9/26	4	Calm	1	38	43	18.00	3	W 4	2	44	44	17.50	35	53	0.6
9/27	5	Calm	1	27	41	16.75	3	Calm	2	39	44	16.25	24	54	0.5
9/28	3	Calm	1	31	46	16.00	4	Calm	2	40	44	14.00	30	49	0.4
9/29	4	Calm	4	43	44	14.00	4	W 5-10	2	48	44	14.50	39	49	16.0
9/30	4	SW 10	3	48	46	15.75									

[a] Sky code: 1 - Clear sky, cloud covering not more than 1/10 of sky, 2 - Cloud covering not more than 1/2 of sky, 3 - Cloud covering more than 1/2 of sky, 4 - Overcast, 5 -Fog or thick haze.

[b] Precipitation code: 1 - None, 2 - Scattered showers, 3 - Mist, 4 - Rain.

[c] Water Level was measured to the nearest quarter of an inch.

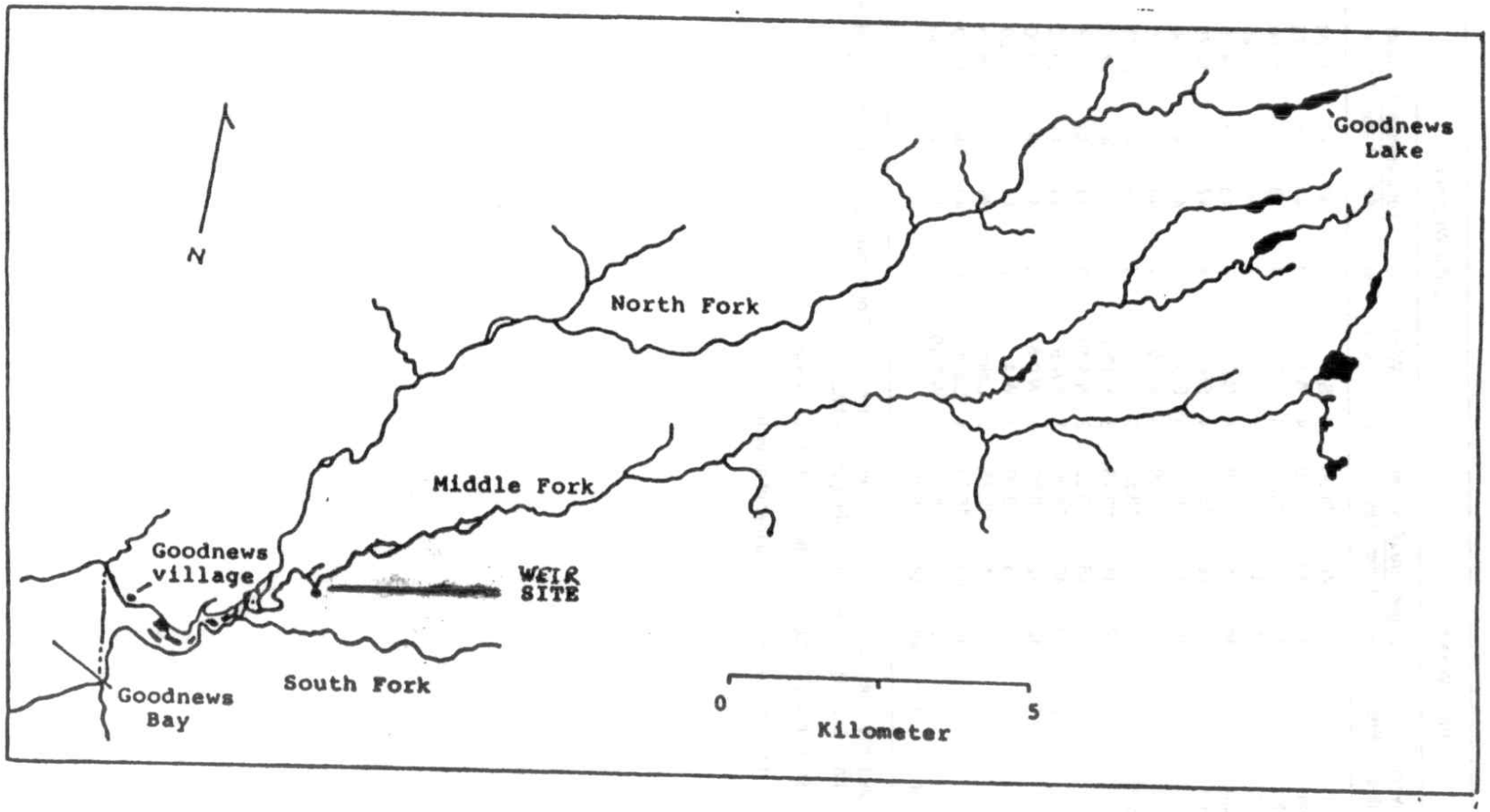

Figure 1. Map of the Goodnews River drainage.

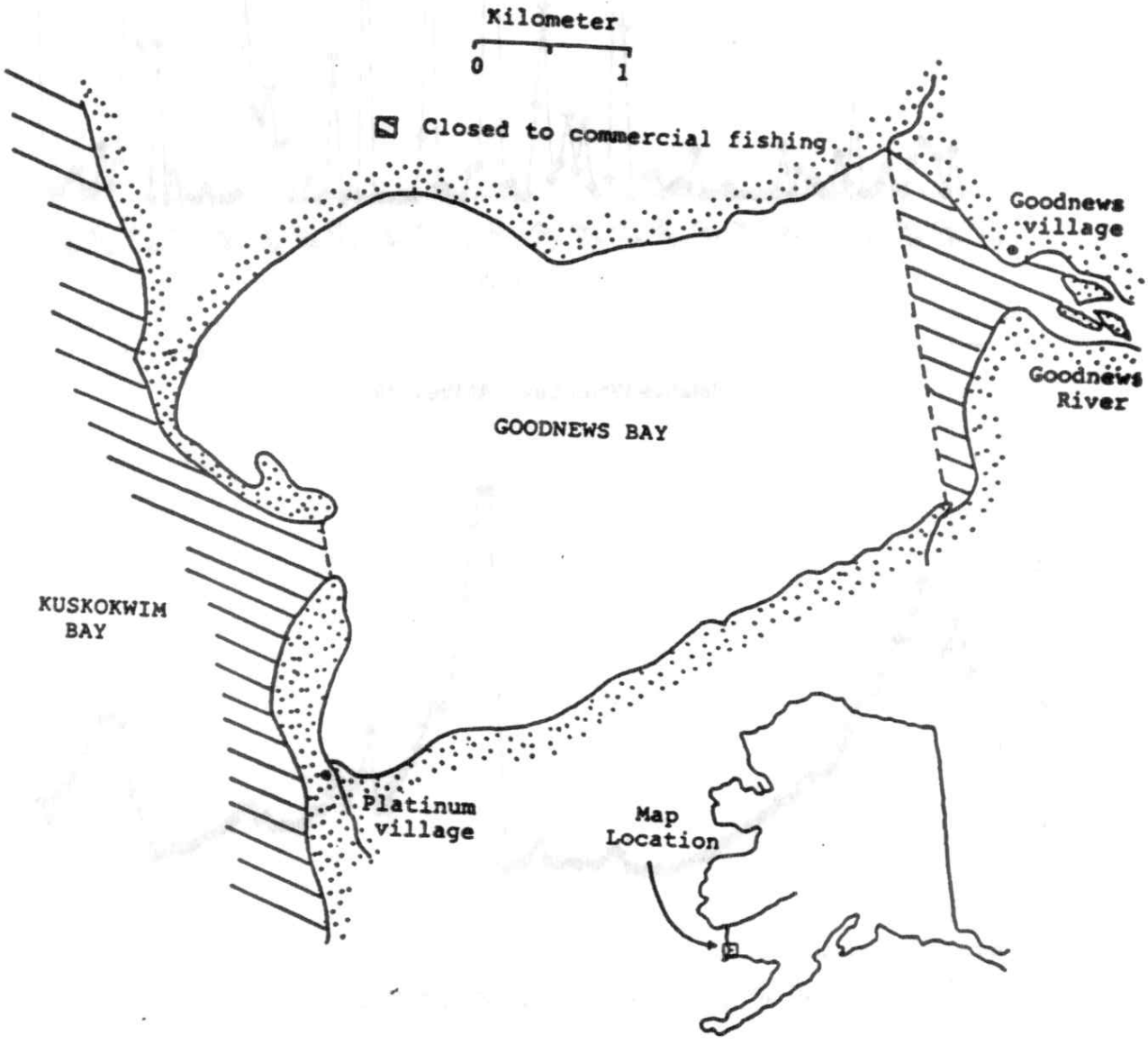

Figure 2. Map of Goodnews Bay, District 5, of the Kuskokwim Management Area.

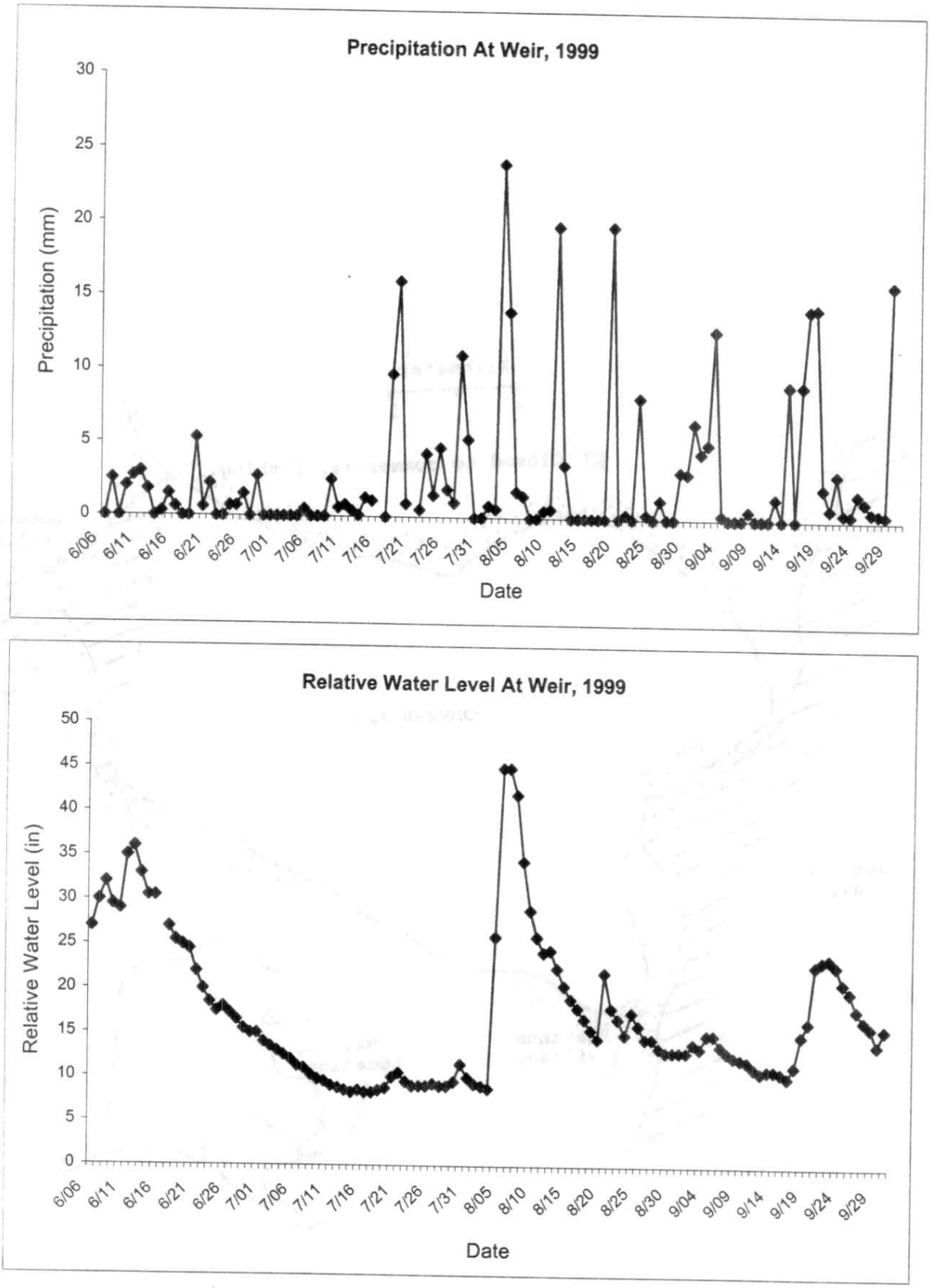

Figure 3. Precipitation and relative water level, Middle Fork Goodnews River weir, 1999.

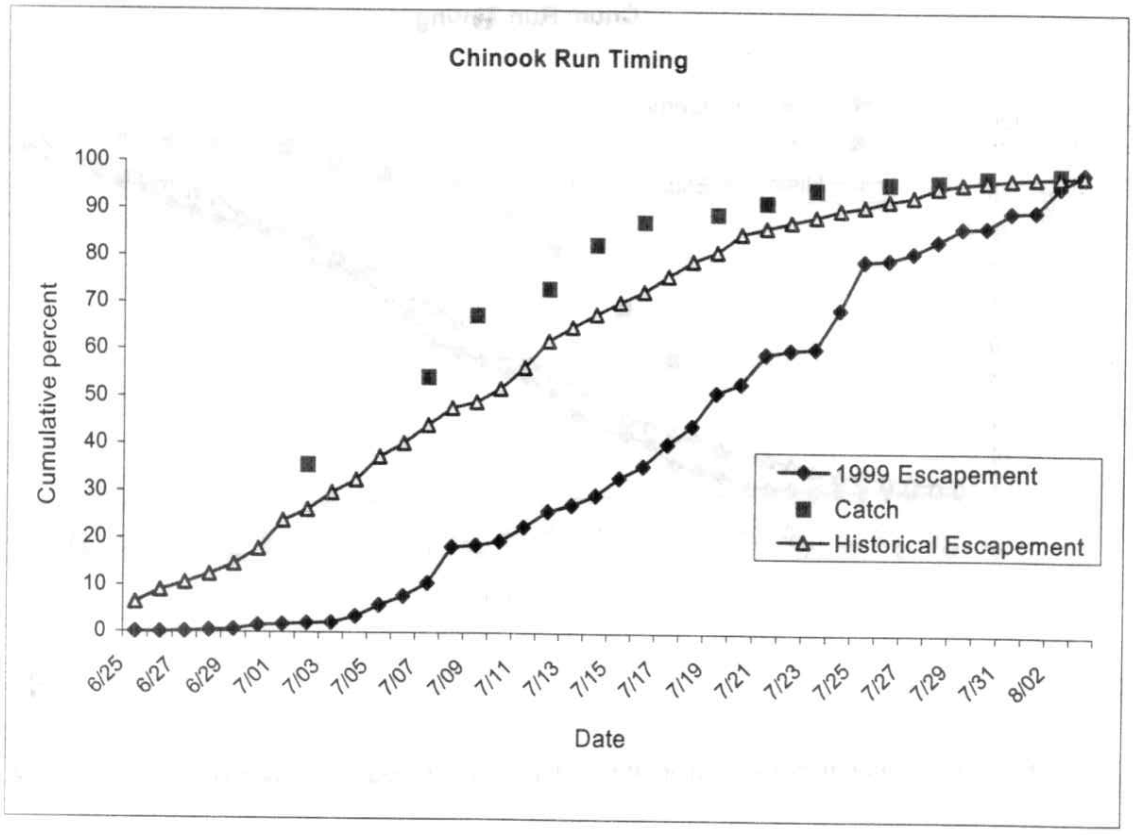

Figure 4. Chinook salmon migration timing at the Middle Fork Goodnews River weir.

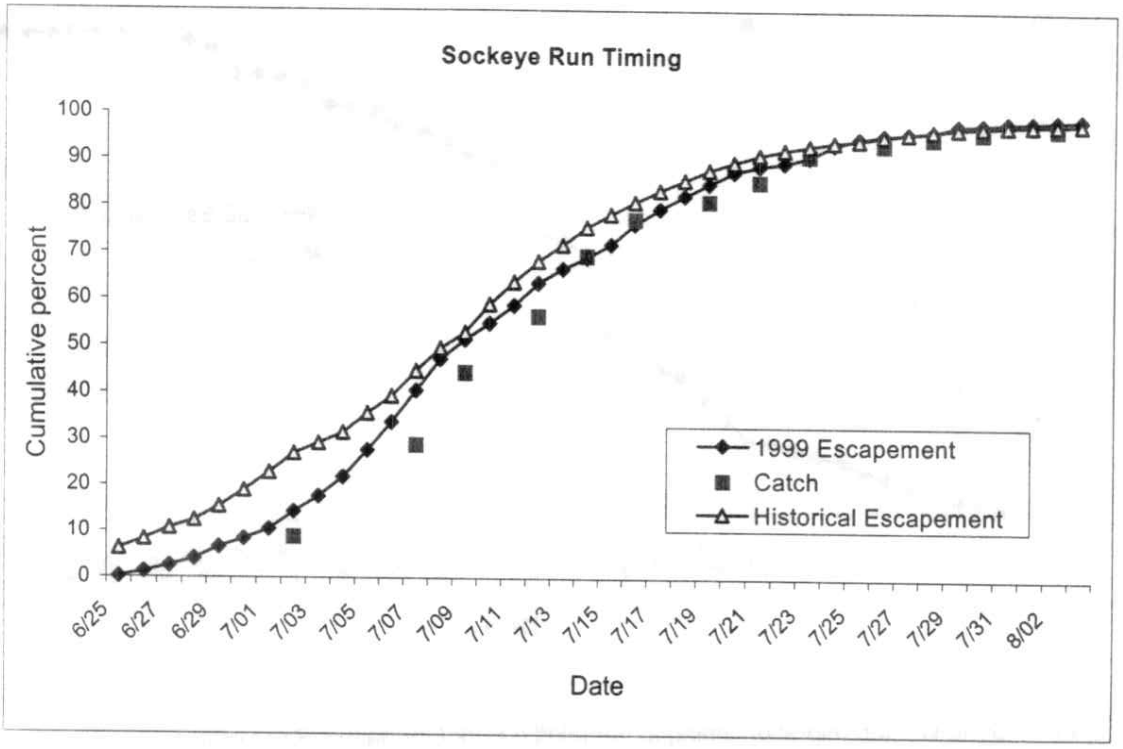

Figure 5. Sockeye salmon migration timing at the Middle Fork Goodnews River weir.

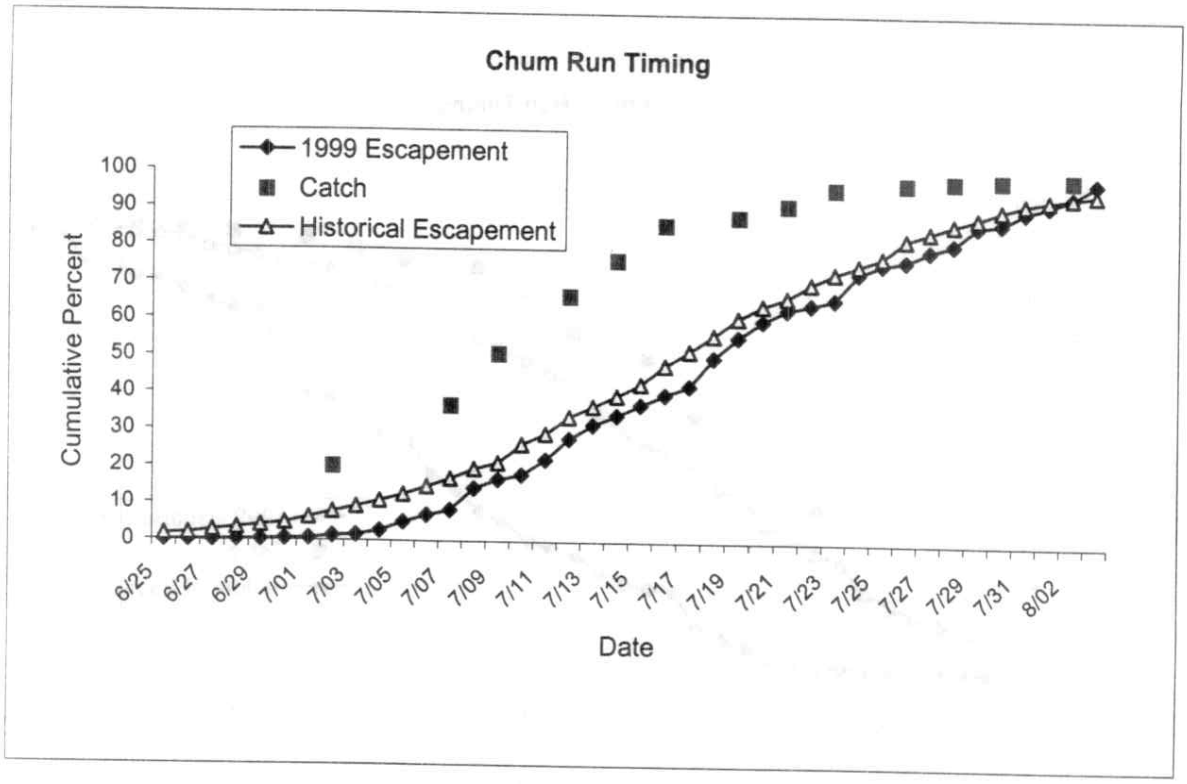

Figure 6. Chum salmon migration timing at the Middle Fork Goodnews River weir.

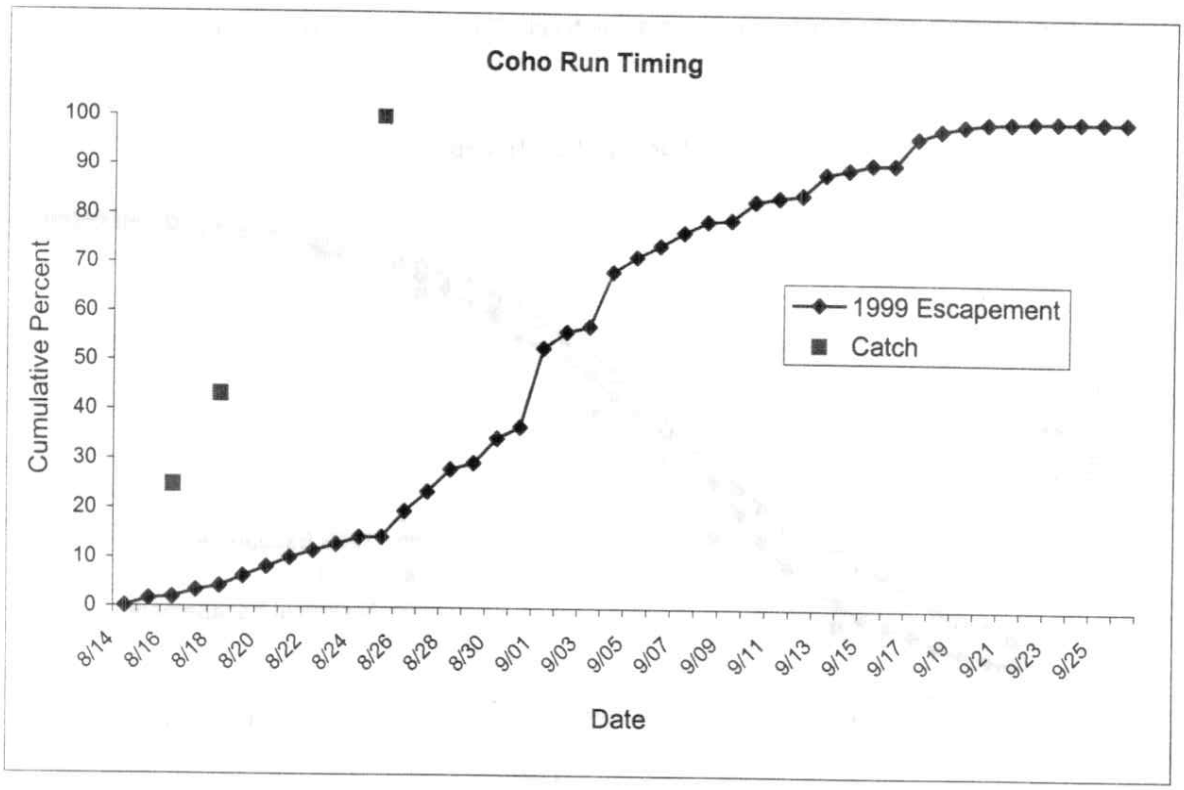

Figure 7. Coho salmon migration timing at the Middle Fork Goodnews River weir.

APPENDIX

Appendix 1. Goodnews Bay, District 5, commercial salmon harvest, 1968 - 1999.

Year	Permits [a]	Chinook	Sockeye	Chum	Coho	Pink	Total
1968	-				5,458		5,458
1969	-	3,978	6,256	5,006	11,631	298	27,169
1970	35	7,163	7,144	12,346	6,794	12,183	45,630
1971	16	477	330	301	1,771	-	2,879
1972	14	264	924	1,331	925	66	3,510
1973	21	3,543	2,072	15,781	5,017	324	26,737
1974	49	3,302	9,357	8,942	21,340	16,373	59,314
1975	50	2,156	9,098	5,904	17,889	419	35,466
1976	40	4,417	5,575	10,354	9,852	8,453	38,651
1977	34	3,336	3,723	6,531	13,335	29	26,954
1978	35	5,218	5,412	8,590	13,764	9,103	42,087
1979	30	3,204	19,581	9,298	42,098	201	74,382
1980	48	2,331	28,632	11,748	43,256	7,832	93,799
1981	48	7,190	40,273	13,642	19,749	11	80,865
1982	48	9,476	38,877	13,829	46,683	4,673	113,538
1983	79	14,117	11,716	6,766	19,660	-	52,259
1984	77	8,612	15,474	14,340	71,176	4,711	114,313
1985	69	5,793	6,698	4,784	16,498	8	33,781
1986	86	2,723	25,112	10,355	19,378	4,447	62,015
1987	69	3,357	27,758	20,381	29,057	54	80,607
1988	125	4,964	36,368	33,059	30,832	5,509	110,732
1989	88	2,966	19,299	13,622	31,849	82	67,818
1990	82	3,303	35,823	13,194	7,804	629	60,753
1991	72	912	39,838	15,892	13,312	29	69,983
1992	111	3,528	39,194	18,520	19,875	14,310	95,427
1993	114	2,117	59,293	10,657	20,014	0	92,081
1994	116	2,570	69,490	28,477	47,499	18,017	166,053
1995	118	2,922	37,351	19,832	17,875	39	78,019
1996	53	1,375	30,717	11,093	43,836	22	87,043
1997	54	2,039	31,451	11,729	2,983	0	48,202
1998	50	3,675	27,161	14,155	21,246	411	66,648
1999	73	1,888	22,910	11,562	2,474	0	38,834
Ten Year Average (1989 - 98)	86	2,541	38,962	15,717	22,629	30 [b]	83,203

[a] Permits that made at least one delivery during the year.

[b] Average of odd years only

Appendix 2. Historical estimated salmon run size and commercial exploitation rate, Goodnews River drainage, 1981 - 1999.

Year	Species	Middle Fork Tower Estimate	Middle Fork Aerial Survey Count as a Percentage of Tower Est.	North Fork Goodnews River Escapement Estimate	Goodnews Bay Subsistence Harvest Estimate	Goodnews Bay Commercial Harvest	Total Run Size Estimate	Exploitation [a] Rate (% of run)
1981	Chinook	3,688	[b]	7,766 [c]	1,409	7,190	20,053	43%
	Sockeye	49,108	[b]	100,029 [c]	3,511 [d]	40,273	192,921	23%
	Chum	21,827	[b]	53,799 [c]	-	13,642	89,268	15%
1982	Chinook	1,395	[b]	2,937 [c]	1,236	9,476	15,044	71%
	Sockeye	56,255	[b]	114,587 [c]	2,754 [d]	38,877	212,473	20%
	Chum	6,767	[b]	16,679 [c]	-	13,829	37,275	37%
1983	Chinook	6,022	36%	14,398	1,066	14,117	35,603	43%
	Sockeye	25,813	22%	69,955	1,518 [d]	11,716	109,002	12%
	Chum	15,548	[b]	38,323 [c]	-	6,766	60,637	11%
1984	Chinook	3,260	35%	8,743	629	8,612	21,244	43%
	Sockeye	32,053	27%	67,213	964	15,474	115,704	14%
	Chum	19,003	35%	117,739	189	14,340	151,271	10%
1985	Chinook	2,831	70%	7,979	426	5,793	17,029	37%
	Sockeye	24,131	11%	50,481	704	6,698	82,014	9%
	Chum	10,367	32%	25,025	348	4,784	40,524	13%
1986	Chinook	2,092	57%	4,094	555	2,723	9,464	35%
	Sockeye	51,069	28%	93,228	942	25,112	170,351	15%
	Chum	14,764	38%	51,910	191	10,355	77,220	14%
1987	Chinook	2,272	100%	4,490	816	3,357	10,935	38%
	Sockeye	28,871	85%	51,989	955	27,758	109,573	26%
	Chum	17,517	58%	37,802	578	20,381	76,278	27%
1988	Chinook	2,712	39%	5,419	310	4,964	13,405	39%
	Sockeye	15,799	30%	38,319	1,065	36,368	91,551	41%
	Chum	20,799	21%	39,501	448	33,059	93,807	36%
1989	Chinook	1,915	67%	2,891	467	2,966	8,239	42%
	Sockeye	21,186	60%	35,476	869	19,299	76,830	26%
	Chum	10,380	28%	15,495	760	13,622	40,257	36%
1990	Chinook	3,636	[b]	7,656 [c]	682	3,303	15,277	26%
	Sockeye	31,679	[b]	64,528 [c]	905	35,823	132,935	28%
	Chum	6,410	[b]	15,799 [c]	342	13,194	35,745	38%
1991 [e]	Chinook	1,952	[b]	4,521 [c]	682	912	8,067	20%
	Sockeye	47,397	[b]	96,544 [c]	900	39,838	184,679	22%
	Chum	27,525	[b]	67,844 [c]	106	15,892	111,367	14%
1992	Chinook	1,903	61%	1,854	252	3,528	7,537	50%
	Sockeye	27,268	21%	52,501	905	39,194	119,868	33%
	Chum	22,023	19%	16,084	662	18,520	57,289	33%

- Continued -

Appendix 2. (page 2 of 2)

Year	Species	Middle Fork Weir Estimate	Middle Fork Aerial Survey Count as a Percentage of Weir Est.	North Fork Goodnews River Escapement Estimate	Goodnews Bay Subsistence Harvest Estimate	Goodnews Bay Commercial Harvest	Total Run Size Estimate	Exploitation [a] Rate (% of run)
1993	Chinook	2,349	[b]	4,727 [c]	488	2,117	9,681	27%
	Sockeye	26,452	[b]	54,325 [c]	572	59,293	140,642	43%
	Chum	14,952	[b]	38,061 [c]	133	10,657	63,803	17%
1994	Chinook	3,856	[b]	7,866 [c]	657	2,570	14,949	22%
	Sockeye	55,751	[b]	115,405 [c]	652	69,490	241,298	29%
	Chum	34,849	[b]	91,653 [c]	402	28,477	155,381	19%
1995	Chinook	4,836	[b]	9,865 [c]	552	2,922	18,175	19%
	Sockeye	39,009	[b]	80,749 [c]	787	37,351	157,896	24%
	Chum	33,699	[b]	88,628 [c]	329	19,832	142,488	14%
1996	Chinook	2,930	[b]	5,977 [c]	526	1,375	10,808	18%
	Sockeye	58,264	[b]	120,606 [c]	763	30,717	210,350	15%
	Chum	40,450	[b]	106,384 [c]	326	11,093	158,253	7%
1997	Chinook	2,937	51%	7,216	449	2,039	12,641	20%
	Sockeye	35,530	57%	23,462	609	31,451	91,052	35%
	Chum	17,296	[b]	45,488 [c]	133	11,729	74,646	16%
1998	Chinook	4,584	18%	3,797	718	3,675	12,774	34%
	Sockeye	47,951	25%	14,693	508	27,161	90,313	31%
	Chum	28,905	15%	24,940	316	14,155	68,316	21%
1999	Chinook	3,221	[b]	6,565 [c]	871 [f]	1,888	12,545	22%
	Sockeye	48,205	[b]	99,727 [c]	872 [f]	22,910	171,714	14%
	Chum	19,533	[b]	51,361 [c]	281 [f]	11,562	82,737	14%

[a] Commercial and subsistence exploitation.

[b] Incomplete aerial survey results.

[c] Average Middle Fork/Goodnews River escapement estimate ratio for 1983 - 1989 used to estimate Goodnews River escapement in years with no aerial survey data. The years 1993 - 1997 include the results from 1992 in the escapement estimate ratio. For 1999 the escapement estimate ratio for 1998 was included.

[d] Subsistence caught chum salmon is included in subsistence sockeye salmon harvest.

[e] Goodnews Tower Project changed to a weir project in 1991.

[f] Preliminary.

Appendix 3. Aerial survey results, Goodnews River drainage, 1980 - 1999.

Year	North Fork Goodnews River and Lake			Middle Fork Goodnews River and Lakes		
	Chinook	Sockeye	Chum	Chinook	Sockeye	Chum
1980	1,228	75,639	1,975	1,164	18,926	3,782
1981	[a]	[a]	[a]	[a]	[a]	[a]
1982	1,990	19,160	9,700	1,546	2,327	6,300
1983	2,600	9,650	[a]	2,500	5,900	[a]
1984	3,245	12,807	28,124	1,930	12,897	9,172
1985	3,535	2,843	4,415	869	7,401	1,780
1986	1,068	8,960	11,850	1,249	16,990	7,645
1987	2,244	19,786	12,103	2,222	24,533	9,696
1988	[a]	[a]	[a]	1,024	5,831	5,814
1989	651	3,605	[a]	1,277	8,044	2,922
1990	658	27,689	[a]	[a]	[a]	[a]
1991	[a]	[a]	[a]	[a]	[a]	[a]
1992	875	10,397	1,950	1,012	7,200	3,270
1993	[a]	[a]	[a]	[a]	[a]	[a]
1994	[a]	[a]	[a]	[a]	[a]	[a]
1995	3,314	[a]	[a]	[a]	[a]	[a]
1996	[a]	[a]	[a]	[a]	[a]	[a]
1997	3,611	12,610	[a]	1,447	19,843	[a]
1998	578	3,497	2,734	731	11,632	3,619
1999	[a]	[a]	[a]	[a]	[a]	[a]
Escapement Objective [b]	1,600	15,000	17,000	800	5,000	4,000

[a] Information not available, poor survey, or survey conducted well before or after peak spawning.

[b] Escapement objectives are preliminary and are subject to change as additional data becomes available. Escapement objectives are based on aerial index counts which do not represent total escapement, but do reflect annual spawner abundance trends when made using standard survey methods under acceptable survey conditions.

Appendix 4. Historical cumulative proportion of chinook, sockeye, and chum salmon escapement at the Middle Fork Goodnews River weir.

	Chinook [a]		Sockeye [a]		Chum [a]	
Date	1981 - 1997	1993 - 1997	1981 - 1997	1993 - 1997	1981 - 1997	1993 - 1997
13-Jun	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
14-Jun	0.0000	0.0001	0.0001	0.0002	0.0000	0.0001
15-Jun	0.0000	0.0002	0.0003	0.0002	0.0000	0.0001
16-Jun	0.0000	0.0003	0.0004	0.0004	0.0000	0.0001
17-Jun	0.0004	0.0004	0.0006	0.0007	0.0000	0.0001
18-Jun	0.0005	0.0006	0.0010	0.0011	0.0001	0.0002
19-Jun	0.0014	0.0021	0.0020	0.0014	0.0001	0.0002
20-Jun	0.0028	0.0032	0.0035	0.0036	0.0001	0.0004
21-Jun	0.0053	0.0037	0.0063	0.0050	0.0002	0.0005
22-Jun	0.0087	0.0098	0.0135	0.0160	0.0016	0.0039
23-Jun	0.0163	0.0155	0.0224	0.0260	0.0028	0.0070
24-Jun	0.0314	0.0447	0.0372	0.0452	0.0041	0.0099
25-Jun	0.0480	0.0636	0.0560	0.0623	0.0081	0.0156
26-Jun	0.0692	0.0895	0.0758	0.0826	0.0111	0.0187
27-Jun	0.0896	0.1058	0.1059	0.1069	0.0173	0.0269
28-Jun	0.1100	0.1240	0.1341	0.1245	0.0229	0.0341
29-Jun	0.1350	0.1457	0.1676	0.1543	0.0300	0.0405
30-Jun	0.1668	0.1785	0.1999	0.1897	0.0400	0.0483
01-Jul	0.2132	0.2378	0.2398	0.2286	0.0583	0.0624
02-Jul	0.2419	0.2614	0.2833	0.2698	0.0739	0.0783
03-Jul	0.2733	0.2972	0.3157	0.2924	0.0908	0.0926
04-Jul	0.3036	0.3244	0.3549	0.3152	0.1115	0.1080
05-Jul	0.3474	0.3730	0.4083	0.3567	0.1354	0.1257
06-Jul	0.3797	0.4019	0.4548	0.3938	0.1567	0.1472
07-Jul	0.4236	0.4406	0.5083	0.4476	0.1811	0.1687
08-Jul	0.4583	0.4770	0.5601	0.4955	0.2064	0.1962
09-Jul	0.4838	0.4895	0.6066	0.5298	0.2364	0.2122
10-Jul	0.5236	0.5181	0.6583	0.5901	0.2847	0.2626
11-Jul	0.5667	0.5632	0.7049	0.6379	0.3222	0.2915
12-Jul	0.6058	0.6196	0.7460	0.6828	0.3675	0.3374
13-Jul	0.6376	0.6492	0.7821	0.7183	0.4029	0.3663
14-Jul	0.6742	0.6765	0.8151	0.7560	0.4371	0.3952
15-Jul	0.7099	0.7021	0.8444	0.7838	0.4827	0.4277
16-Jul	0.7369	0.7257	0.8703	0.8106	0.5391	0.4775
17-Jul	0.7687	0.7593	0.8896	0.8351	0.5877	0.5171
18-Jul	0.7977	0.7912	0.9076	0.8573	0.6293	0.5600
19-Jul	0.8206	0.8109	0.9240	0.8800	0.6626	0.6062
20-Jul	0.8497	0.8493	0.9370	0.8968	0.6980	0.6403
21-Jul	0.8679	0.8622	0.9484	0.9123	0.7310	0.6620
22-Jul	0.8909	0.8751	0.9581	0.9236	0.7761	0.6996

- Continued -

Appendix 4. (page 2 of 2)

Date	Chinook [a]		Sockeye [a]		Chum [a]	
	1981 - 1997	1993 - 1997	1981 - 1997	1993 - 1997	1981 - 1997	1993 - 1997
23-Jul	0.9094	0.8870	0.9651	0.9324	0.8126	0.7288
24-Jul	0.9281	0.9018	0.9710	0.9413	0.8370	0.7498
25-Jul	0.9386	0.9094	0.9746	0.9452	0.8614	0.7727
26-Jul	0.9493	0.9212	0.9794	0.9543	0.8922	0.8217
27-Jul	0.9570	0.9308	0.9823	0.9594	0.9089	0.8423
28-Jul	0.9681	0.9506	0.9858	0.9660	0.9340	0.8634
29-Jul	0.9746	0.9583	0.9881	0.9705	0.9475	0.8819
30-Jul	0.9796	0.9626	0.9901	0.9743	0.9601	0.9045
31-Jul	0.9826	0.9677	0.9912	0.9770	0.9677	0.9215
01-Aug	0.9845	0.9708	0.9922	0.9795	0.9725	0.9332
02-Aug	0.9865	0.9733	0.9930	0.9814	0.9760	0.9415
03-Aug	0.9883	0.9762	0.9935	0.9828	0.9792	0.9491
04-Aug	0.9906	0.9801	0.9942	0.9843	0.9833	0.9593
05-Aug	0.9923	0.9825	0.9949	0.9862	0.9865	0.9666
06-Aug	0.9939	0.9855	0.9954	0.9874	0.9887	0.9720
07-Aug	0.9957	0.9894	0.9960	0.9892	0.9913	0.9787
08-Aug	0.9967	0.9915	0.9966	0.9906	0.9928	0.9824
09-Aug	0.9975	0.9931	0.9971	0.9921	0.9941	0.9853
10-Aug	0.9980	0.9945	0.9975	0.9930	0.9960	0.9904
11-Aug	0.9983	0.9952	0.9977	0.9937	0.9965	0.9915
12-Aug	0.9983	0.9955	0.9980	0.9944	0.9972	0.9932
13-Aug	0.9987	0.9964	0.9983	0.9954	0.9978	0.9945
14-Aug	0.9989	0.9971	0.9985	0.9960	0.9982	0.9954
15-Aug	0.9991	0.9975	0.9988	0.9966	0.9986	0.9962
16-Aug	0.9993	0.9979	0.9990	0.9973	0.9989	0.9969
17-Aug	0.9994	0.9983	0.9991	0.9976	0.9991	0.9975
18-Aug	0.9995	0.9987	0.9993	0.9980	0.9994	0.9984
19-Aug	0.9996	0.9989	0.9993	0.9982	0.9995	0.9986
20-Aug	0.9996	0.9990	0.9995	0.9987	0.9997	0.9992
21-Aug	0.9998	0.9994	0.9996	0.9989	0.9998	0.9994
22-Aug	0.9998	0.9996	0.9997	0.9992	0.9999	0.9996
23-Aug	0.9999	0.9997	0.9998	0.9993	0.9999	0.9998
24-Aug	0.9999	0.9999	0.9999	0.9997	1.0000	0.9999
25-Aug	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

[a] The cumulative proportion does not include the years 1982, 1985, 1989, 1991, 1992, and 1996 due to either a late initiation of the project in that year or a number of missed days due to flooding.

Appendix 5. Age and sex composition of Goodnews Bay chinook salmon commercial gillnet catch samples, 1999.

		Brood Year and Age Group [a]				
		1995	1994	1993	1992	Total
		1.2	1.3	1.4	1.5	
Stratum Date:	7/2					
Sample Size:	0					
Total	Percent of Sample					
	Number in Catch					672
Stratum Date:	7/7					
Sampling Date:	7/7 [b]					
Sample Size:	102					
Male	Percent of Sample	38.2	9.8	15.7	0.0	63.7
	Number in Catch	135	35	55	0	224
Female	Percent of Sample	0.0	2.9	32.3	1.0	36.3
	Number in Catch	0	10	114	3	128
Total	Percent of Sample	38.2	12.7	48.0	1.0	100.0
	Number in Catch	135	45	169	3	352
Stratum Date:	7/9					
Sampling Date:	7/9					
Sample Size:	147					
Male	Percent of Sample	22.4	6.1	19.7	0.0	48.3
	Number in Catch	56	15	49	0	120
Female	Percent of Sample	4.1	7.5	38.8	1.4	51.7
	Number in Catch	10	19	96	3	128
Total	Percent of Sample	26.5	13.6	58.5	1.4	100.0
	Number in Catch	66	34	145	3	248
Stratum Dates:	7/12 - 8/25					
Sampling Date:	7/12					
Sample Size:	63					
Male	Percent of Sample	28.6	12.7	11.1	0.0	52.4
	Number in Catch	176	78	68	0	323
Female	Percent of Sample	0.0	4.8	42.9	0.0	47.6
	Number in Catch	0	30	264	0	293
Total	Percent of Sample	28.6	17.5	54.0	0.0	100.0
	Number in Catch	176	108	332	0	616
Strata Dates:	Season					
Sampling Dates:	[c]					
Sample Size:	312					
Total	Percent of Sample					
	Number in Catch					1,888

[a] The number of fish in each stratum age and sex category are derived from the sample percentages; discrepancies in sums are attributed to rounding.

[b] Sex of all fish was confirmed by visual inspection of gonads.

[c] Sampling dates do not meet the criteria for estimating escapement percentages of stratum.

Appendix 6. Length (mm measured from mid-orbit to fork-of-tail) by age and sex of Goodnews Bay chinook salmon commercial gillnet catch samples, 1999.

		Brood Year and Age Group			
		1995	1994	1993	1992
		1.2	1.3	1.4	1.5
Sample Date:	7/2				
Sample Size:	0				
Sample Date:	7/7				
Sample Size:	102				
Male	Mean Length	530	715	814	-
	Std. Error	6	26	23	-
	Range	440-588	569-830	685-950	-
	Sample Size	39	10	16	0
Female	Mean Length	-	791	859	910
	Std. Error	-	37	10	-
	Range	-	753-864	729-965	910-910
	Sample Size	0	3	33	1
Sample Date:	7/9				
Sample Size:	147				
Male	Mean Length	526	685	853	-
	Std. Error	7	34	17	-
	Range	465-621	559-811	669-1038	-
	Sample Size	33	9	29	0
Female	Mean Length	545	738	859	839
	Std. Error	10	24	10	23
	Range	509-573	621-864	554-1037	816-861
	Sample Size	6	11	57	2
Sample Date:	7/12				
Sample Size:	63				
Male	Mean Length	536	698	888	-
	Std. Error	14	14	58	-
	Range	430-639	632-768	655-1068	-
	Sample Size	18	8	7	0
Female	Mean Length	-	805	873	-
	Std. Error	-	15	10	-
	Range	-	776-828	749-963	-
	Sample Size	0	3	27	0
Sample Dates:	Season [a]				
Sample Size:	312				
Male	Mean Length				
	Range				
	Sample Size				
Female	Mean Length				
	Range				
	Sample Size				

[a] Sampling dates do not meet criteria for estimating mean length for the entire season.

Appendix 7. Age and sex composition of Goodnews Bay sockeye salmon commercial gillnet catch samples, 1999.

		Brood Year and Age Group [a]						
		1995		1994		1993		Total
		0.3	1.2	1.3	2.2	1.4	2.3	
Stratum Dates:	7/2, 7/7, 7/9							
Sampling Date:	7/7 [b]							
Sample Size:	179							
Male	Percent of Sample	1.7	8.9	39.1	1.1	1.7	4.4	57.0
	Number in Catch	170	910	3,981	114	171	455	5,801
Female	Percent of Sample	0.5	3.4	34.1	0.6	2.8	1.7	43.0
	Number in Catch	57	341	3,469	57	284	171	4,379
Total	Percent of Sample	2.2	12.3	73.2	1.7	4.5	6.1	100.0
	Number in Catch	227	1,251	7,450	171	455	626	10,180
Stratum Dates:	7/12, 7/14, 7/16							
Sampling Date:	7/12 [b]							
Sample Size:	185							
Male	Percent of Sample	0.5	15.1	40.5	1.6	2.1	3.3	63.2
	Number in Catch	41	1,141	3,057	122	163	245	4,769
Female	Percent of Sample	0.0	4.9	28.1	1.1	1.1	1.6	36.8
	Number in Catch	0	367	2,119	82	82	122	2,771
Total	Percent of Sample	0.5	20.0	68.6	2.7	3.2	4.9	100.0
	Number in Catch	41	1,508	5,176	204	245	367	7,540
Stratum Dates:	7/19 - 8/25							
Sampling Date:	7/21							
Sample Size:	168							
Male	Percent of Sample	0.6	17.9	31.5	2.4	0.6	2.4	55.4
	Number in Catch	31	927	1,637	124	31	124	2,873
Female	Percent of Sample	0.0	10.7	29.2	0.0	1.2	3.6	44.6
	Number in Catch	0	556	1,514	0	62	185	2,317
Total	Percent of Sample	0.6	28.6	60.7	2.4	1.8	6.0	100.0
	Number in Catch	31	1,483	3,151	124	93	309	5,190
Strata Dates:	Season [c]							
Sample Size:	532							
Male	Percent of Sample	1.1	13.0	37.9	1.6	1.6	3.6	58.7
	Number in Escapement	242	2,978	8,675	360	364	823	13,442
Female	Percent of Sample	0.2	5.5	31.0	0.6	1.9	2.1	41.3
	Number in Escapement	57	1,264	7,102	138	428	478	9,468
Total	Percent of Sample	1.3	18.5	68.9	2.2	3.5	5.7	100.0
	Number in Escapement	299	4,242	15,777	498	792	1,301	22,910

[a] The number of fish in each stratum age and sex category are derived from the sample percentages; discrepancies in sums are attributed to rounding.

[b] Sex of all fish was confirmed by visual inspection of gonads.

[c] The number of fish in the "Season" summary are the stratum sums. "Season" percentages are derived from the sums.

Appendix 8. Length (mm measured from mid-orbit to fork-of-tail) by age and sex of Goodnews Bay sockeye salmon commercial gillnet catch samples, 1999.

		Brood Year and Age Group					
		1995		1994		1993	
		0.3	1.2	1.3	2.2	1.4	2.3
Sample Date:	7/7						
Sample Size:	179						
Male	Mean Length	591	513	580	507	623	576
	Std. Error	1	5	2	14	5	6
	Range	589-592	472-535	532-626	492-521	613-632	555-598
	Sample Size	3	16	70	2	3	8
Female	Mean Length	551	514	544	498	571	550
	Std. Error	-	12	2	-	11	6
	Range	551-551	476-554	500-597	498-498	548-605	543-562
	Sample Size	1	6	61	1	5	3
Sample Date:	7/12						
Sample Size:	185						
Male	Mean Length	552	535	581	540	590	580
	Std. Error	-	5	2	19	4	14
	Range	552-552	484-599	543-620	502-564	580-598	516-612
	Sample Size	1	28	75	3	4	6
Female	Mean Length	-	507	551	511	544	542
	Std. Error	-	6	3	3	23	13
	Range	-	486-532	497-592	508-514	521-567	518-564
	Sample Size	0	9	52	2	2	3
Sample Date:	7/21						
Sample Size:	168						
Male	Mean Length	565	527	575	519	586	592
	Std. Error	-	6	4	25	-	12
	Range	565-565	425-592	452-619	449-568	586-586	573-625
	Sample Size	1	30	53	4	1	4
Female	Mean Length	-	522	542	-	520	538
	Std. Error	-	7	3	-	35	5
	Range	-	462-592	499-595	-	485-554	512-549
	Sample Size	0	18	49	0	2	6
Sample Dates:	Season [a]						
Sampling Size:	532						
Male	Mean Length	581	526	580	522	605	579
	Range	552-592	425-599	452-626	449-568	580-632	516-625
	Sample Size	5	74	198	9	8	18
Female	Mean Length	551	516	546	506	558	544
	Range	551-551	462-592	497-597	498-514	485-605	512-564
	Sample Size	1	33	162	3	9	12

[a] Season mean lengths are weighted by the catch in each stratum.

Appendix 9. Age and sex composition of Goodnews Bay chum salmon commercial gillnet catch samples, 1999.

		Brood Year and Age Group [a]				
		1996	1995	1994	1993	Total
		0.2	0.3	0.4	0.5	
Stratum Dates : 7/2, 7/7, 7/9 Sampling Dates: 7/7, 7/9 Sample Size: 192 [b]						
Male	Percent of Sample	0.0	37.0	10.4	0.5	47.9
	Number in Catch	0	2,167	611	31	2,808
Female	Percent of Sample	0.0	38.0	14.1	0.0	52.1
	Number in Catch	0	2,229	824	0	3,053
Total	Percent of Sample	0.0	75.0	24.5	0.5	100.0
	Number in Catch	0	4,396	1,435	31	5,861
Stratum Dates : 7/12, 7/14, 7/16 Sampling Dates: 7/12, 7/16 [b] Sample Size: 189 [b]						
Male	Percent of Sample	0.0	40.7	7.4	0.0	48.1
	Number in Catch	0	1,642	299	0	1,940
Female	Percent of Sample	0.0	38.1	13.8	0.0	51.9
	Number in Catch	0	1,535	554	0	2,090
Total	Percent of Sample	0.0	78.8	21.2	0	100.0
	Number in Catch	0	3,177	853	0	4,030
Stratum Dates: 7/19 - 8/25 Sampling Date: 7/21 Sample Size: 74						
Male	Percent of Sample	1.4	23.0	2.7	0.0	27.0
	Number in Catch	23	384	45	0	452
Female	Percent of Sample	0.0	56.7	16.2	0.0	73.0
	Number in Catch	0	948	271	0	1,219
Total	Percent of Sample	1.4	79.7	18.9	0.0	100.0
	Number in Catch	23	1,332	316	0	1,671
Strata Dates: Season [c] Sample Size: 455						
Male	Percent of Sample	0.2	36.3	8.2	0.3	45.0
	Number in Catch	23	4,193	954	31	5,200
Female	Percent of Sample	0.0	40.7	14.3	0.0	55.0
	Number in Catch	0	4,712	1,650	0	6,362
Total	Percent of Sample	0.2	77.0	22.5	0.3	100.0
	Number in Catch	23	8,905	2,604	31	11,562

[a] The number of fish in each stratum age and sex category are derived from the sample percentages; discrepancies in sums are attributed to rounding.

[b] Sex of all fish was confirmed by visual inspection of gonads.

[c] The number of fish in the "Season" summary are the stratum sums. "Season" percentages are derived from the sums.

Appendix 10. Length (mm measured from mid-orbit to fork-of-tail) by age and sex of Goodnews Bay chum salmon commercial gillnet catch samples, 1999.

		Brood Year and Age Group			
		1996	1995	1994	1993
		0.2	0.3	0.4	0.5
Sample Dates:	7/7, 7/9				
Sample Size:	192				
Male	Mean Length	-	589	615	650
	Std. Error	-	3	6	-
	Range	-	519-651	579-668	650-650
	Sample Size	0	71	20	1
Female	Mean Length	-	568	579	-
	Std. Error	-	2	4	-
	Range	-	505-610	545-629	-
	Sample Size	0	73	27	0
Sample Dates:	7/12, 7/16				
Sample Size:	189				
Male	Mean Length	-	589	607	-
	Std. Error	-	3	8	-
	Range	-	528-645	558-648	-
	Sample Size	0	77	14	0
Female	Mean Length	-	567	578	-
	Std. Error	-	2	3	-
	Range	-	531-602	540-612	-
	Sample Size	0	72	26	0
Sample Date:	7/21				
Sample Size:	74				
Male	Mean Length	523	587	614	-
	Std. Error	-	5	1	-
	Range	523-523	556-618	612-615	-
	Sample Size	1	17	2	0
Female	Mean Length	-	557	573	-
	Std. Error	-	3	10	-
	Range	-	504-599	522-630	-
	Sample Size	0	42	12	0
Sample Dates:	Season [a]				
Sample Size:	455				
Male	Mean Length	523	589	612	650
	Range	523-523	519-651	558-668	650-650
	Sample Size	1	165	36	1
Female	Mean Length	-	565	578	-
	Range	-	504-610	522-630	-
	Sample Size	0	187	65	0

[a] Season mean lengths are weighted by the catch in each stratum.

Appendix 11. Age and sex composition of Goodnews Bay coho salmon commercial gillnet catch samples, 1999.

		Brood Year and Age Group [a]			
		1996	1995	1994	Total
		1.1	2.1	3.1	
Stratum Dates:	7/23 - 8/18				
Sampling Date:	8/16				
Sample Size:	76				
Male	Percent of Sample	10.5	50.0	1.3	61.8
	Number in Catch	113	534	14	661
Female	Percent of Sample	5.3	30.3	2.6	38.2
	Number in Catch	56	324	28	408
Total	Percent of Sample	15.8	80.3	3.9	100.0
	Number in Catch	169	858	42	1,069
Stratum Date:	8/25				
Sampling Date:	8/25				
Sample Size:	129				
Male	Percent of Sample	2.3	40.3	2.3	45.0
	Number in Catch	33	567	33	632
Female	Percent of Sample	3.9	48.1	3.1	55.0
	Number in Catch	54	675	43	773
Total	Percent of Sample	6.2	88.4	5.4	100.0
	Number in Catch	87	1,242	76	1,405
Strata Dates:	Season [b]				
Sample Size:	205				
Male	Percent of Sample	5.8	44.5	1.9	52.3
	Number in Catch	145	1,101	47	1,293
Female	Percent of Sample	4.5	40.4	2.9	47.7
	Number in Catch	111	999	71	1,181
Total	Percent of Sample	10.3	84.9	4.8	100.0
	Number in Catch	256	2,100	118	2,474

[a] The number of fish in each stratum age and sex category are derived from the sample percentages; discrepancies in sums are attributed to rounding.

[b] The number of fish in the "Season" summary are the stratum sums. "Season" percentages are derived from the sums.

Appendix 12. Length (mm measured from mid-orbit to fork-of-tail) by age and sex of Goodnews Bay coho salmon commercial gillnet catch samples, 1999.

		Brood Year and Age Group		
		1996	1995	1994
		1.1	2.1	3.1
Sample Date:	8/16			
Sample Size:	75			
Male	Mean Length	578	587	583
	Std. Error	20	8	-
	Range	492-634	452-678	583-583
	Sample Size	8	38	1
Female	Mean Length	568	581	560
	Std. Error	10	9	36
	Range	547-595	470-618	524-595
	Sample Size	4	22	2
Sample Date:	8/25			
Sample Size:	128			
Male	Mean Length	567	602	599
	Std. Error	7	5	36
	Range	554-578	503-660	527-642
	Sample Size	3	52	3
Female	Mean Length	578	600	609
	Std. Error	14	4	4
	Range	535-615	529-649	602-622
	Sample Size	5	61	4
Strata Dates:	Season [a]			
Sample Size:	203			
Male	Mean Length	576	595	594
	Range	492-634	452-678	527-642
	Sample Size	11	90	4
Female	Mean Length	573	594	589
	Range	535-615	470-649	524-622
	Sample Size	9	83	6

[a] Season mean lengths are weighted by the catch in each stratum.

Appendix 13. Historical salmon escapement at the Middle Fork Goodnews River project, 1981 - 1999.

Year	Operating period [a]	Chinook	Sockeye	Chum	Pink	Coho [b]
1981	June 13 - Aug. 15	3,688	49,108	21,827	1,327	357
1982	June 23 - Aug. 03	1,395	56,255	6,767	13,855	62
1983	June 11 - July 28	6,027	25,813	15,548	34	0
1984	June 15 - July 31	3,260	32,053	19,003	13,744	249
1985	June 27 - July 31	2,831	24,131	10,367	144	282
1986	June 16 - July 24	2,080	51,069	14,764	8,133	163
1987	June 22 - July 30	2,272	28,871	17,517	62	62
1988	June 23 - July 30	2,712	15,799	20,799	6,781	6
1989	June 29 - July 31	1,915	21,186	10,380	246	145
1990	June 20 - July 24	3,636	31,679	6,410	3,378	0
1991	June 29 - Aug. 25	1,952	47,397	27,525	1,694	1,978
1992	June 21 - Aug. 16	1,903	27,267	22,023	23,030	[c]
1993	June 22 - Aug. 18	2,349	26,452	14,952	318	1,451
1994	June 22 - Aug. 16	3,856	55,751	34,849	38,705	[c]
1995	June 19 - Aug. 28	4,836	39,009	33,669	330	5,415
1996	June 18 - Aug. 23	2,882	57,504	40,125	20,105	10,869
1997	June 12 - Sept. 17	2,937	35,530	17,296	940	9,619
1998	July 04 - Sept. 17	4,584	47,951	28,905	10,376	35,441
1999	June 25 - Sept. 26 [c]	3,221	48,205	19,533	914	11,545

[a] In years where the project was intiated later than normal or during times the weir was not operational, interpolation was used to estimate escapement for the time period missed (see Appendix 14).

[b] The coho escapement continues into October and the majority of the run was not counted (except in 1997, 1998 and 1999).

[c] A number of days were missed due to flooding and no interpolation was attempted.

Appendix 14. Percentage of salmon counts estimated at the Middle Fork Goodnews River project, 1991 - 1999.

Year	Operating period [a]	Chinook	Sockeye	Chum	Pink	Coho
1991	June 29 - Aug. 25	0%	15%	2%	0%	0%
1992	June 21 - Aug. 16	29%	43%	15%	3%	0%
1993	June 22 - Aug. 18	14%	22%	8%	0%	0%
1994	June 22 - Aug. 16	20%	16%	20%	0%	0%
1995	June 19 - Aug. 28	0%	0%	0%	0%	0%
1996	June 18 - Aug. 23	26%	24%	27%	28%	11%
1997	June 12 - Sept. 17	2%	1%	8%	0%	0%
1998	July 04 - Sept. 17	32%	32%	11%	0%	3%
1999	June 25 - Sept. 26 [b]	0%	0%	0%	0%	0%

[a] Estimates were made for some species when the weir was not operational from June 15 thorough August 16. Previous to 1991 the project was a counting tower and the majority of the counts were estimated based on a systematic counting schedule.

[b] Weir was out for 10 days in early August, but no interpolation was attempted.